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# Generate sales leads from email conversation using AI/ML

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DISSERTATION

*Submitted in partial fulfillment of the requirements of  
M. Tech. Software Engineering Degree programme*

*By*

Roshan Kumar GUPTA

ID No. 2018HS70003

*Under the supervision of:*

Rupali ARORA

&

M Saurabh SHARMA

Dissertation work carried out at  
SAP Labs, Bangalore

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE PILANI, PILANI CAMPUS

April 2022

SE SAP ZG629T DISSERTATION

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**SECOND SEMESTER 2021-22**

**SESAP ZG629T DISSERTATION**

**Dissertation Title:** Generate sales leads from email conversation using AI/ML

**Name of the Supervisor:** Rupali Arora

**Name of the Student:** Roshan Kumar Gupta

**BITS Id of the Student:** 2018HS70003

*Abstract*

The goal of this project is to develop a highly intelligent machine learning model that can predict sentiment from sales emails. The goal is to provide a working UI dashboard with email template creation and a machine learning model. Users can input data into the UI, and the machine learning model will analyse the data and make predictions that will aid salespeople in making decisions. It automates the procedure and decreases the time it takes for manual processes.

**Keywords:** Machine Learning, Supervised Learning, Unsupervised Learning, Natural language processing.

# Abbreviations

<b>UI</b>	<b>U</b> ser <b>I</b> nterface
<b>URI</b>	<b>U</b> niform <b>R</b> esource <b>I</b> dentifier
<b>API</b>	<b>A</b> pplication <b>P</b> rogramming <b>I</b> nterface
<b>ML</b>	<b>M</b> achine <b>L</b> earning
<b>NLP</b>	<b>N</b> atural <b>L</b> anguage <b>P</b> rocessing

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# Chapter 1

## Introduction & Background

The project is centered around the Natural language processing. NLP is a field of Artificial Intelligence that gives the machines the ability to read, understand and derive meaning from human languages. It can solve various problems related to natural languages like sentiment analysis, speech recognition and etc.

The process of detecting positive or negative sentiment in text is known as sentiment analysis. Businesses frequently utilise it to detect sentiment in social data, assess brand reputation, and gain a better understanding of their customers. Sentiment analysis is quickly becoming a crucial tool for monitoring and understanding sentiment in all forms of data, as humans communicate their thoughts and feelings more openly than ever before. Brands can learn what makes customers happy or frustrated by automatically evaluating customer feedback, such as comments in survey replies and social media dialogues. This allows them to customise products and services to match their customers' demands.

The sales process, often known as the sales cycle, is the process by which your organisation sells its product or service to clients. From the initial contact with a lead through the final sale, it entails a sequence of processes. There are seven stages in the sales process but this project mainly deals with identification of leads. Prospect for potential customers.

- Make contact with prospects.
- Qualify prospects.
- Nurture prospects.

- Present your offer.
- Overcome objections.
- Close the deal.

## Chapter 2

# Problem Statement

A sales lead is a person or business who may eventually become a client. Sales lead also refers to the data that identifies an entity as a potential buyer of a product or service. Businesses gain access to sales leads through advertising, trade shows, direct mailings, third parties, and other marketing efforts. A sales lead is not really a sales "prospect" per se because a business would need to examine and qualify the potential new client further to determine their intent and interest.

There are various types of sales leads, such as hot leads, cold leads, warm leads, information qualified leads, and so on. Salespeople spent more time reading marketing and campaign emails in order to discover leads who could become potential customers. The primary goal of this project is to eliminate the amount of time salespeople spend identifying sales leads.

## Chapter 3

# Objective of the Project

The main objective and outcome this project is to train sales data with both supervised and unsupervised algorithm, it will also extract named entity information from mail contents which can give vital information to end users and develop a rest API using python and flask for the inference. There will be an machine learning solution that will assist salespeople in identifying leads more quickly and saving time.

There will be UI dashboard made of UI5 framework where users can see the results and visualizations in graph.

The UI will also allow generating the template for sending emails to customer, Analysis on the possibility of integration with outlook. it solves the problem by reducing the the time and effort of sales people and allow sales team to sell products more effectively.

## Chapter 4

# Uniqueness of the Project

SAP already has a product for handling sales leads and sales processes, and it includes a number of distinct processes. However, it is primarily manual. This type of activity is also done manually by sales teams. This initiative eliminates human labour while simultaneously making the process more intelligent through the use of machine learning. It is a narrow sector that only involves email communication. The dataset has been trained using both supervised and unsupervised algorithms, making the ML model more clever when it comes to identifying the sentiment from email conversations.

## Chapter 5

# Benefit to the Organization

SAP has a solution for this called lead management, which controls the entire sales process, but it is a manual procedure. In SAP, there is a sales staff that keeps track of leads in excel and manually identifies sales leads. These are the benefits it provides to salespeople in SAP.

- Reduce the time and effort for salesperson.
- ML model to assist sales team.
- Generate named entity recognition from emails
- UI dashboard to display the model results and leads information.
- Generate a template for user which can be used for sending a mail.

## Chapter 6

# Scope of Work

The scope of this project is to develop a machine learning model using supervised(SVN, random forest, naive bayes) and unsupervised(text blob) learning classification algorithm and train it on a sales dataset that can be used to predict various types of sales leads. The ML model will also construct named entity recognition, which can be useful for decision making. Customers will be able to study the results and graph visualisations using a UI dashboard developed on the UI5 framework. The user interface will also let you create a template for delivering emails to your consumers.

## Chapter 7

# Solution Architecture

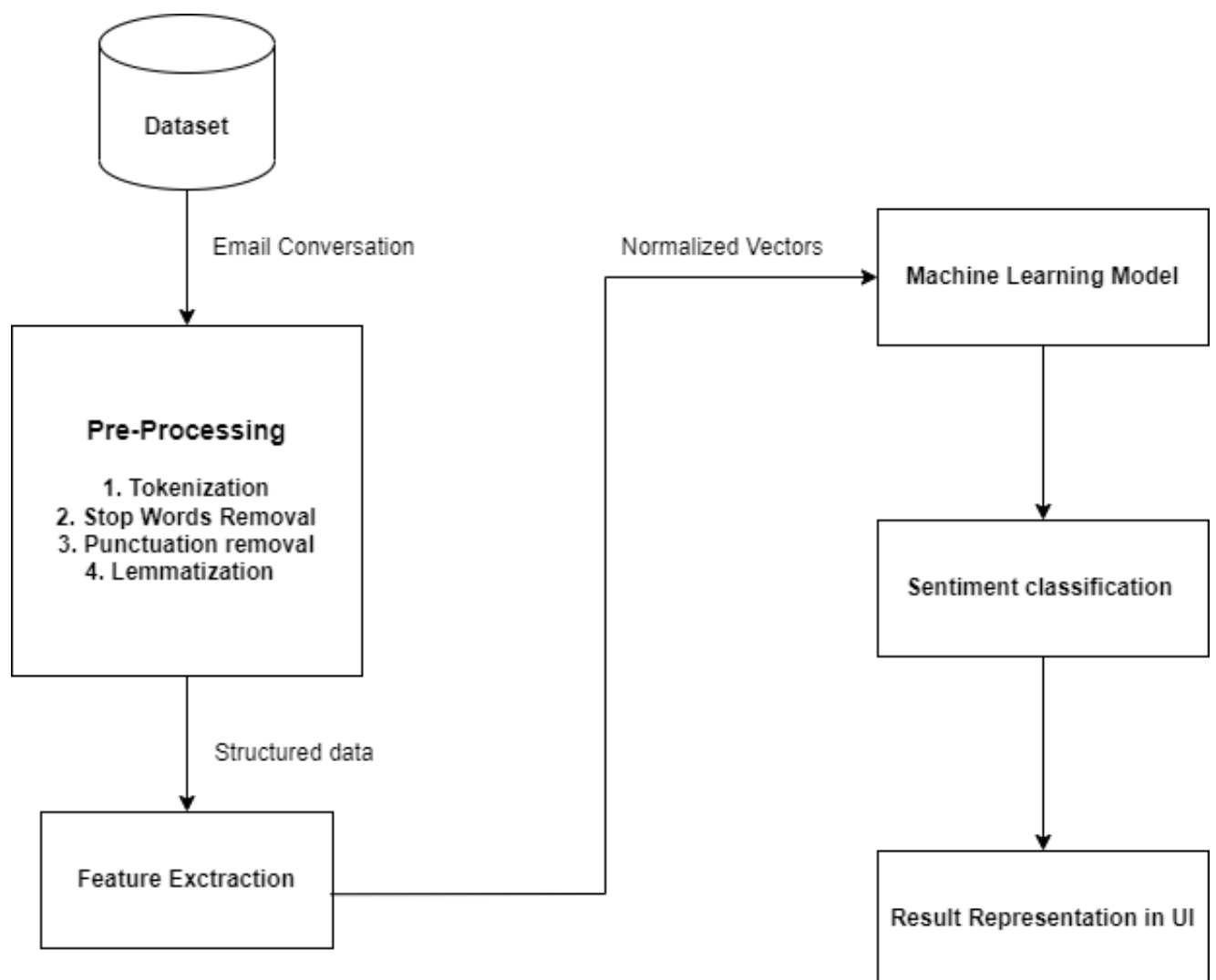


FIGURE 7.1: Architecture of machine learning model



The proposed approach can be broken down into many phases.

## **Dataset**

The first step is to get data from various sources or to create it yourself. For this project, the majority of the dataset was obtained through Kaggle, and the data needed to be labelled in order to train with supervised algorithms.

## **Pre-Processing**

The data is usually in text format, so it will be pre-processed and cleaned in this step, such as removing punctuation, stopwords, and special characters, stemming, lemmatization, and tokenization, and the output will be clean text. To pre-process the text, NLTK and Spacy python libraries were used.

## **Feature Extraction**

The important features of the document will be extracted in this stage, and the token will be turned into a numerical value. Because only numeric values are recognised by the machine. Count vectorization and TF-IDF are two methods that have been utilised to turn tokens into vectors.

## **Machine Learning Model**

After the data has been cleaned and normalised into vectors, the next step is to train the data using machine learning algorithms. ML algorithms that have been utilised include Naive Bayes, Random Forest, and SVM, among others. Lexicon-based techniques have also been employed for sentiment analysis.

## **Sentiment Classification**

In this step, a trained ML model was serialised into pickel format using SKlearn, and a rest API was built on top of the serialised model for prediction and UI integration.

## UI Representation

The model predictions were utilised to construct a user interface dashboard that allows users to view analytics and visualisations.

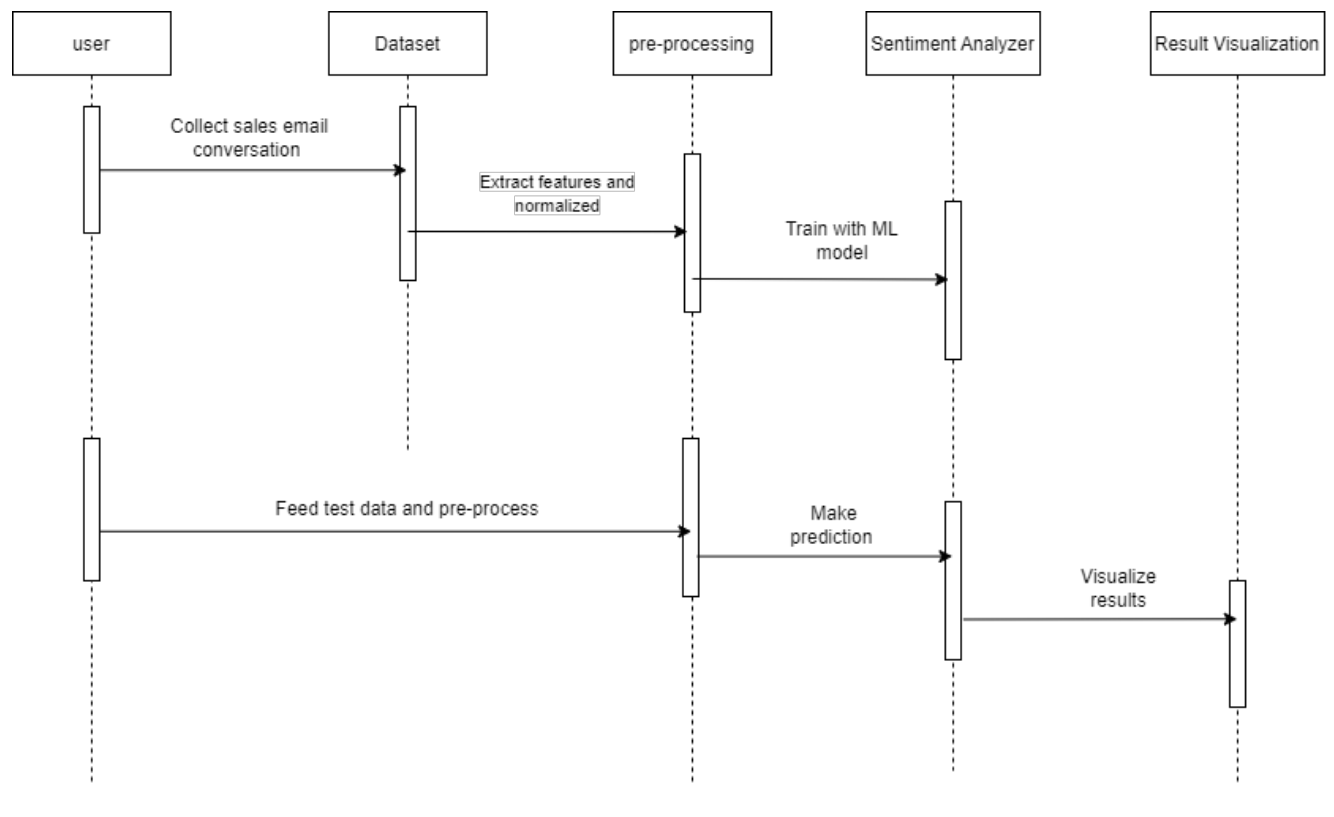


FIGURE 7.2: Sequence diagram of ML solution

## Chapter 8

# Resources Needed

- Python Server
- Sales data-set
- Jupyter Notebook
- UI5
- Outlook

## Chapter 9

# Project Plan and Deliverable

Serial. Num- ber	Tasks	Start date - End date (in Calendar Weeks)	Planned dura- tion (weeks)	Specific deliverables
1.	System and database set up for creating machine learning model and API	21 Feb to 27 Feb	1	Complete system and database set up for development of project
2.	Analyze and collect sales conversation data for training the machine learning model	28 Feb to 13 Mar	2	Complete sales data set for training the algorithm
3.	Analyze different ML algorithms(supervised and unsupervised), Implement ML model and train the model with data set	14 Mar to 17 Apr	5	Trained machine learning model with data set and named entity recognition

4.	Hyper parameter optimization of algorithm	18 Apr to 24 Apr	1	Increased Accuracy of algorithm
5.	Create a rest API for the model which can be consumed	25 Apr to 1 May	1	Rest API which can be used for UI integration
6.	Create UI dashboard for displaying model results and relevant information about leads	2 May to 22 May	3	UI dashboard for displaying model results and visualizations
7.	Generate a template which can be used by customers for response	23 May to 5 Jun	2	Developing a email template
8.	Analysis on possibility of integration with outlook	6 Jun to 12 Jun	1	Analysis result

## Chapter 10

### Work Accomplished so far

Serial. Num- ber	Tasks	Start date - End date (in Calendar Weeks)	Planned dura- tion (weeks)	Specific deliverables
1.	System and database set up for creating machine learning model and API	21 Feb to 27 Feb	1	Complete system and database set up for development of project
2.	Analyze and collect sales conversation data for training the machine learning model	28 Feb to 13 Mar	2	Complete sales data set for training the algorithm
3.	Analyze different ML algorithms(supervised and unsupervised), Implement ML model and train the model with data set	14 Mar to 17 Apr	5	Trained machine learning model with data set and named entity recognition

4.	Hyper parameter optimization of algorithm	18 Apr to 24 Apr	1	Increased Accuracy of algorithm
5.	Create a rest API for the model which can be consumed	25 Apr to 1 May	1	Rest API which can be used for UI integration and basic UI App

## Chapter 11

# Key Challenges Faced

The key challenges of this project so far have been:

- To get the correct labeled dataset for sales email conversation
- To get good accuracy from supervised learning algorithm
- To design a UI for email template generation
- Integrating the app with outlook
- Designing the UI for data visualisations



## Chapter 12

# Potential risks and mitigation plan

The most major risk identified thus far has been linked to supervised model training accuracy, which indicates that the accuracy acquired will be poor if data is not labelled correctly or there is insufficient data for training. The training data must be accurately labelled and in sufficient volumes to achieve high accuracy.

## Chapter 13

### Plan for remainder of the project

Serial. Num- ber	Tasks	Start date - End date (in Calendar Weeks)	Planned dura- tion (weeks)	Specific deliverables
6.	Create UI dashboard for displaying model results and relevant information about leads	2 May to 22 May	3	UI dashboard for displaying model results and visualizations
7.	Generate a template which can be used by customers for response	23 May to 5 Jun	2	Developing a email template
8.	Analysis on possibility of integration with outlook	6 Jun to 12 Jun	1	Analysis result

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BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

**2<sup>nd</sup> Semester 2021-2022**

**SESAPZG628T DISSERTATION**

**MID SEMESTER EVALUATION FORM**

**Section I**

(To be filled by the student and returned to the Supervisor)

ID No. 2018HS70003 Name of Student: Roshan Kumar Gupta

Name of Supervisor: Rupali Arora

Name of the Examiner(s): M Saurabh Sharma

Dissertation Title: Generate sales leads from email conversation using AI/ML

**Section II**

(To be filled by the Supervisor in consultation with the examiner(s))

**Comments on the dissertation from Examiner and Supervisor (Select Y or N)**

1. Quantum of work
  - a. Justifiable as efforts for 8 weeks duration Y
  - b. Work is in line with the commitments made in outline Y
2. Type of work
  - a. Client assignment N
  - b. Organization specific task Y
  - c. General study project such as white paper N
  - d. Any other (kindly elaborate below in a line or two if Y) N
3. Nature of work
  - a. Routine in nature N
  - b. Involved creativity and rational thinking Y

Kindly elaborate below if answer for above is “Y”

Algorithm study, data synthesis, analytics and analytical UI

4. Evaluation methodology
  - a. Evaluation done based on presentation to supervisor and examiner Y
  - b. Evaluation done through Viva conducted by supervisor and examiner Y
  - c. Student regularly interacted with supervisor and incorporated the suggestions made Y

d. Brief description on the report submitted, quality of presentation and suggestions given for improvement

e.

Analytical UI considering most of the parameters

5. Mid semester evaluation matrix


Tick the appropriate box (1 is lowest and 5 is the highest)

Dimension	Rank→	1	2	3	4	5
<b>Student abilities in general</b>						
Understanding of the subject of dissertation						✓
Creative thinking: ability to come up with new ideas						✓
<b>Viva / Seminar presentation</b>						
Communication ability						✓
Organization of material						✓
Response to review questions						✓
Cohesive thinking ability						✓
<b>Report submitted</b>						
Report structure and format						✓
Technical content of the report						✓
Explanation on the significance of the assignment						✓
Analysis of alternative approaches						✓

Any other comments:

Good work

Date: 13-Apr-2022

  
Saurabh (Apr 13, 2022 12:27 GMT+5.5)  
Signature of examiner(s)

  
Rupali Arora (Apr 13, 2022 12:23 GMT+5.5)  
Signature of Supervisor

**Note: Additional paper can be used for including further comments that is relevant to the work, if required**


# midsem\_eval\_form


Final Audit Report

2022-04-13


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