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Polarity detection using residents' emotional responses in a smart city

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ABSTRACT_ In the last decade, smart city applications have attracted a lot of attention in the field of industrial informatics. However, little focus has been placed on understanding how locals, who may have a major impact on smart city programs, think and feel. To take the "emotional pulse" of a community, we advocate using publicly available, abundant social media dialogues that incorporate contextual information encapsulating individuals' ideas and impressions. To track the appearance of unfavorable public sentiment and emerging ideas, we advocate an automated AI-based statement structure. Using 29,928 social media interactions centered around the hotly disputed topic of autonomous vehicles, which will turn out to be increasingly relevant to smart cities, we assessed the framework's viability. Natural language processing and Markov models were employed to simulate the ebb and flow of people' collective emotions, while a deep learning-based classifier assessed the level of negativity (toxicity) in online discussions. Business executives and government officials may need to use the framework for intelligent commenting on public viewpoints to improve security, communication, and policymaking.

1. INTRODUCTION

2. In order to build a city that is both sustainable and livable for its residents, the concept of "smart cities" centers on the development of high-tech, automated, and interconnected "smart industrial functions" [1]. In spite of the fact that a great deal of focus is placed on smart functions in a smart city setting, little effort has been made to understand the people who make the city operate [2]. It is crucial to use synthetic brain (AI) to understand people' needs in the development of smart industrialisation towards what is being called the fourth industrial revolution.

3. ideas and estimations with respect to business uses. It is important to recognize the citizens' viewpoint even in cognitive automation, where it is said that the optimization and enhancement of many smart objectives depend on the subjective preferences of the individual [3]. While attempts have been made to employ body sensors to gauge individuals' emotional responses [4], continuous monitoring presents privacy and management concerns when utilizing sensors. Also, these physical sensors can't sense the thoughts and emotions of locals, which have a lasting influence on smart city activities [5]. The daily dialogues that take place in people's social media accounts, however, reveal the ways in which they classify their thoughts, observations, and impressions. This lays the door for, and presents an opportunity

for, the development of sophisticated comment systems that make it possible to feel the "emotional pulse" of a city via the collective ideas of its citizens as reflected in easily accessible data sources like social media discussions. The proliferation of social media platforms and the resulting deluge of data records have resulted in an unprecedented trove of information on the lives, thoughts, and sentiments of ordinary people. The explosion of social media has led to a deluge of data that can be mined for insights, much like the "big data" that has been used to capture the voice of the public in recent years [6]. Researchers have found that the vast amounts of user-generated content on social media platforms provide a window of opportunity to learn about the emotional health of a country's population (or its "emotional pulse") [6, 7]. In this piece, we apply the concept of emotional pulse to the smart city setting so that we may better understand how locals feel about their environment and the services it provides. It is crucial to notice and "sense" their grasp [8] in order to shape future enhancements and policies, since all intelligent functions are built around the daily lives of residents and with the purpose of serving people better. Regardless of its significance, the current use of citizen opinion and emotional responses related to smart city functions is constrained to simple sentiment and emotion extraction and does not truly explore the development and change of emotional reactions the use of social media data. Given that researchers in the field of industrial informatics haven't dug deeply into the topic of free-flowing social media content in order to detect the emotional pulse of residents in a smart city context, we advocate the first practical use of social media to capture the pulse of the city by creating an AI-based emotion commentary framework. In a smart city setting, the suggested system may monitor the public mood by analyzing social media chatter, from which insights into new ideas and shifting public sentiment can be drawn.

4.LITERATURE SURVEY

T. Nam and T. A. Pardo,

―Conceptualizing smart city with dimensions of technology, people, and institutions,‖ in Proc. 12th Annu. Int. Digit. Gov. Res. Conf.: Digit. Gov. Innov. Challenging Times, 2011, pp. 282–291

This conceptual paper discusses how we can consider a particular city as a smart one, drawing on recent practices to make cities smart. A set of the common multidimensional components underlying the smart city concept and the core factors for a successful smart city initiative is identified by exploring current working definitions of smart city and a diversity of various conceptual relatives similar to smart city. The paper offers strategic principles aligning to the three main dimensions (technology, people, and institutions) of smart city: integration of infrastructures and technology-mediated services, social learning for strengthening human infrastructure, and governance for

institutional improvement and citizenengagement.

D. Bruckner, H. Zeilinger, and D. Dietrich, ―Cognitive automation— Survey of novel artificial general intelligence methods for the automation of human technical environments,‖ IEEE Trans. Ind. Informat., vol. 8, no.2, pp. 206–215, May 2012

The goal of Ambient Assisted Living Systems is to provide automated technological aids for the elderly to allow for longer independent living in one’s own premises without the need for transition to stationary care. Such systems target to overcome problems introduced by particular risks of the target group like falling down, risk of illnesses, risk of dementia, etc. Current systems, however, still impose substantial effort in commissioning the system and

they lack accuracy in detecting serious problems of the resident. In this article we present methods for relieved commissioning, i.e. automatic detection of the sensors' types and topology, for added fault tolerance, and for modeling and evaluating human activity patterns with the goal of launchingmeaningful alarms.

V. C. C. Roza and O. A. Postolache,

—Citizen emotion analysis in Smart City,‖ in Proc. 7th Int. Conf. Inf., Intell., Syst. Appl., Jul. 2016, pp. 1–6.

Objectives: The study reported in this article aimed to identify: (i) the most relevant applications supported by smart city infrastructure with an impact on the provision of healthcare; (ii) the types of technologies being used; (iii) the maturity levels of the applications being reported; and (iv) major barriers for their dissemination. Methods: A systematic review was performed based on a literature search. Results: A total of 44 articles were retrieved. These studies reported on smart city applications to support population surveillance, active ageing, healthy lifestyles, disabled people, response to emergencies, care services organization, and socialization. Conclusions: Most of the included articles were either of a descriptive and conceptual nature or in an early stage of development, which means that a major barrier for their dissemination is their lack of concreteness.

5.PROPOSED SYSTEM

To monitor citizens' emotions and perceptions in a smart city environment, we propose an AI-based emotionobservation framework. The proposed framework collects data from publicly accessible social media and other conversation platforms (Data Layer). Following that, emotional expressions are extracted from the social media content. The extracted emotions are then used to create an emotion transition model that shows how the emotions change.

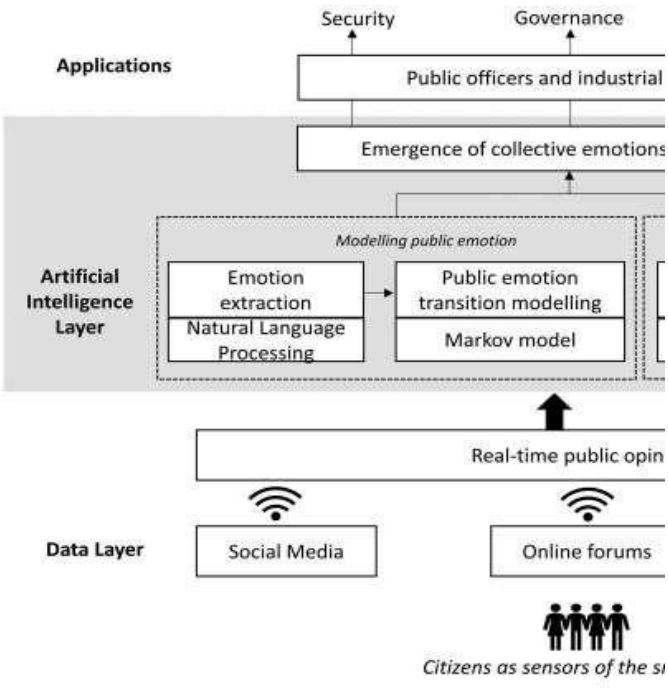


Fig 1:Architecture

IMPLEMENTAION3.1.1LSTM-RNN

Long short-term memory (LSTM) is an artificial recurrent neural network (RNN) architecture used in the field of deep learning. It was proposed in 1997 by **Sepp Hochreiter** and **Jurgenschmidhuber**.

Unlike standard feed-forward neural networks, LSTM has feedback connections. It can process not only single

data points (such as images) but also entiresequences of data (such as speech or video).

For example, LSTM is an application to tasks such as unsegmented, **connected handwriting recognition,** or **speechrecognition**.

A general **LSTM** unit is composed of a cell, an input gate, an output gate, and a forget gate. The cell remembers values over arbitrary time intervals, and three gates regulate the flow of information into and out of the cell. LSTM is well-suited to classify, process, and predict the time series given of unknown duration.

DT WITH BOW

- Decision Tree is a **Supervised learning technique** that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. It is a tree- structured classifier, where **internal nodes represent the features of a dataset, branches represent the decision rules** and **each leaf node represents the outcome.**
- In a Decision tree, there are two nodes, which are the **Decision Node** and **Leaf Node.** Decision nodes are used to makeany decision and have multiple branches, whereas Leaf nodes are the output of those

  decisions and do not contain any further branches.
- The decisions or the test are performed on the basis of features of the given dataset.
- ***It is a graphical representation for getting all the possible solutions to a problem/decision based on givenconditions.***
- It is called a decision tree because, similar to a tree, it starts with the root node, which expands on further branches and constructsa tree-like structure.
- In order to build a tree, we use the **CART algorithm,** which stands for **Classification and**

Regression Tree algorithm.

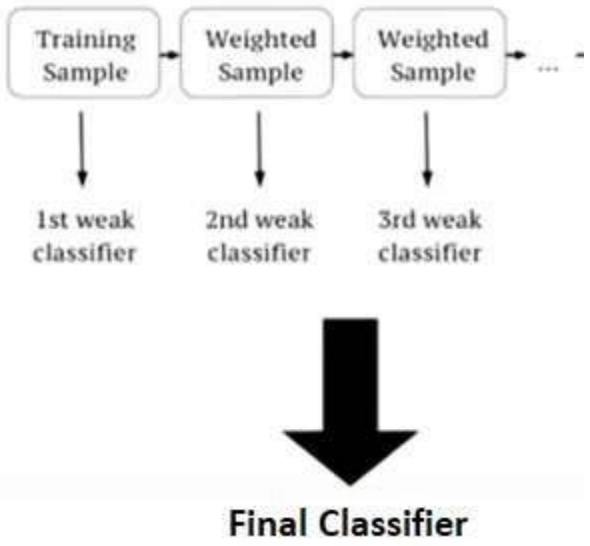
- A decision tree simply asks a question, and based on the answer (Yes/No), it further split the tree into subtrees.
- Below diagram explains the general structure of a decision tree:

XGB

XGBoost is an implementation of Gradient Boosted decision trees. This library was written in C++. It is a type ofSoftware library that was designed basically to improve speed and model performance. It has recently been dominating in applied machine learning. XGBoost models majorly dominate in many Kaggle Competitions.

In this algorithm, decision trees are created in sequential form. Weights playan important role in XGBoost. Weights are assigned to all the independent variables which are then fed into the decision tree which predicts results.

Weight of variables predicted wrong by the tree is increased and these the variables are then fed to the second decision tree. These individual classifiers/predictors then ensemble to give a strong and more precise model. Itcan work on regression, classification, ranking, and user-defined prediction problems.

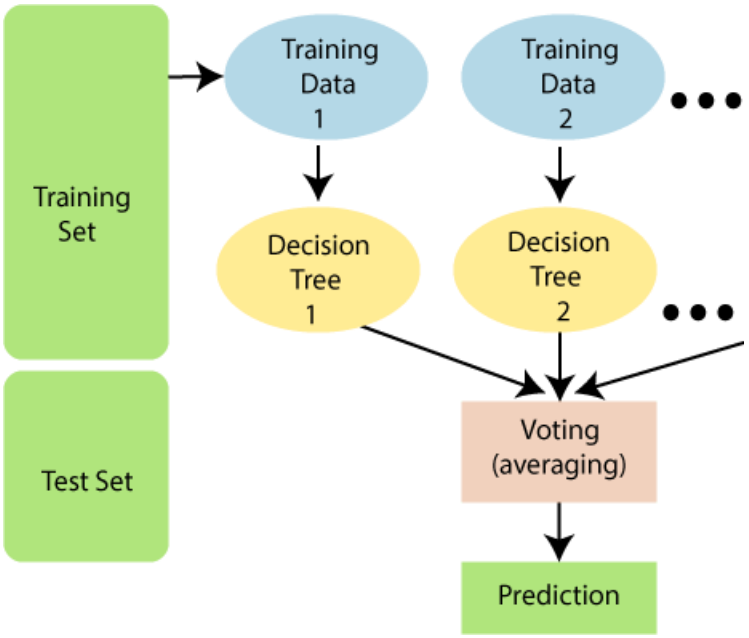


Random Forest Algorithm

Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML. It is based on the concept of **ensemble learning,** which

is a process of *combining multiple classifiers to solve a complex problem and to improve the performance of the model.*

As the name suggests, ***"Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy of thatdataset."*** Instead of relying on one decision tree, the random



Naïve Bayes Classifier Algorithm

- Naïve Bayes algorithm is a supervised learning algorithm, which is based on **Bayes theorem** and used for solving classification problems.
- It is mainly used in *text classification* that includes a high-dimensional training dataset.

- Naïve Bayes Classifier is one of the simple and most effective Classification algorithms which helps in building the fastmachine learning models that can makequick predictions.
- **It is a probabilistic classifier, which means it predicts on the basis of the probability of an object**.
- Some popular examples of Naïve BayesAlgorithm are **spam filtration, Sentimental analysis, and classifying articles**.

6.RESULTS AND DISCUSSION

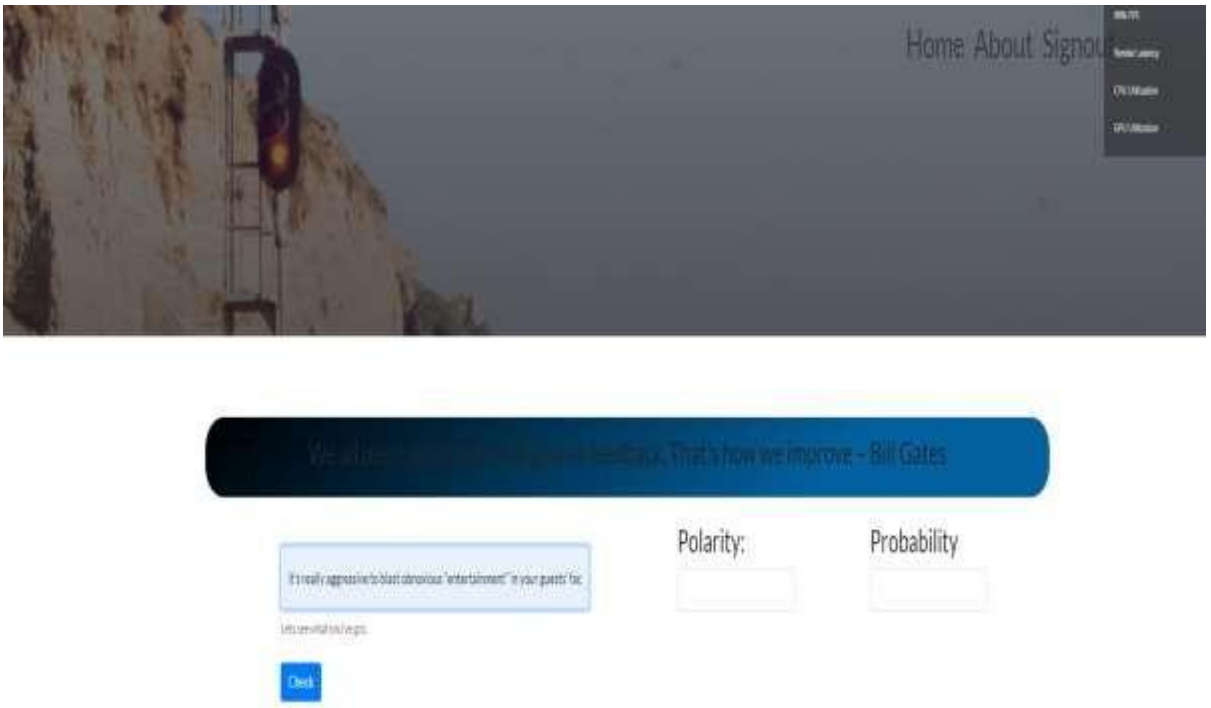


Fig 1:entering data for emotion prediction

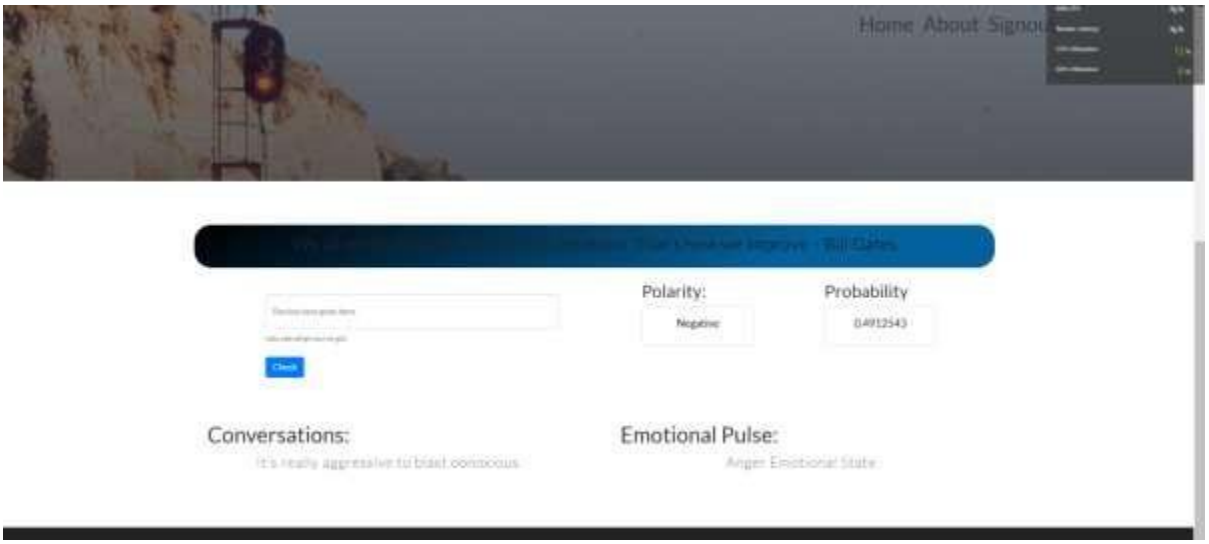


Fig 2:Prediting emotion

Add OUTPUT SCREENS HERE

SnO	ALGORITHM	ACCURACY
1	LSTM-RRN	90%
2	DT	74%
3	XGB	76%
4	RANDOMFOREST	77%
5	Naïve Bayes	77%

7.CONCLUSION

In this article, we introduced an AI-based emotion remark framework to reveal the thoughts and perceptions of residents by means of publicly on hand social media data. Using Twitter responses towards self- driving vehicles, we established how the thoughts and negativity emerge at some stage in an incident time and shift over time. We used a aggregate of NLP, probabilistic models, and deep getting to know to create emotion modeling and toxicity detection abilities of the proposed

framework. By growing and evaluating this AI framework, we enabled the seize and illustration of the emotional pulse of the city. We located this amongst pioneering research to use AI to seize citizens' emotional pulse from digital records channels, hence created an overview of citizens' feelings associated to clever town initiatives. Compared to typical survey opinions, social media statistics have severa benefits as they seize publicly available, often updated, and voluminous data, which are enriched with brazenly expressed thoughts and emotions

of citizens. This will serve as a robust basis to make use of statistics by way of social media and different clever dialog platforms for representing citizens' emotions. The consequences and the functionality of the use of AI for perception citizens' emotional pulse have the conceivable to inform approach improvement and policymaking for industrial leaders as properly as for elections, political campaigns, and g o v e r n a n c e

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