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Forest Fires Detection Using Machine Learning Techniques

Mr. Nilkanth Akash Deepak, Mr. Karpe Siddhesh Sham, Mr. Gavali Mayur Sanjay Mr.Bhamre Tushar Vasant
Department of Computer Engineering BVCOE & Rc Nashik, Maharashtra,India
Department of Computer Engineering BVCOE & Rc Nashik, Maharashtra,India
Department of Computer Engineering BVCOE & Rc Nashik, Maharashtra,India
Department of Computer Engineering BVCOE & Rc Nashik, Maharashtra,India
Prof. S.R.Jadhav Department of Computer Engineering BVCOE & Rc Nashik, Maharashtra,India

ABSTRACT
Nowadays, forest fires became one of the foremost important problems that cause damage to several. Areas around the world. The paper displays machine learning regression techniques for predicting forest fire-prone areas. The data set used in this paper is presented within the UCI machine learning repository that consists of climate and physical factors of the Montesano's park in Portugal. This research proposes three machine learning approaches, linear regression, ridge regression, and lasso regression algorithm with data set size 517 entries and 3 features for each row, all features are included in the first, and 70% of the features were included in the second. This Approach uses a training set which is 70% of the data set, and the test set is 30% of the data set. The accuracy of the linear regression algorithm gives more accuracy than ridge regression and lasso regression algorithms..

Keywords: - *Forest Fire Prediction, Linear Regression Model.*

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I. INTRODUCTION

1.1 MOTIVATION:

Our Nature are our first priority. They all are motivation for us to done this work. Several Forest are burn and Lots of animals are dead, such as Fire occur in Amazon that provide rapid guidance to predict the Forest Fire.

1.2 PROBLEM STATEMENT:

To develop a system that predicts Fire in Forest using Linear Regression model. Therefore, the proposed solution is designed to: Train a prediction model using Linear Regression Model Predict the possibility of wildfire of the given set of attributes

II. LITERATURE REVIEW

Fire cause disturbances which is inherent, unavoidable and affects in all levels of an ecosystem" (White and Jentsch, 2019). The disturbances caused by the fire cannot be avoided and it can occur in the young, recently established vegetation as well as in a fully grown natural forest. Fire has concentrated effects on vegetation development since fire wipe out unwanted vegetation and thus creating emergent space for other species to occupy (Oliver, 1990). The skillful burning of the vegetation cover has affected water and vegetation composition of the disturbed areas and eventually adapted to the new conditions. Besides the influential effect on water moisture content and vegetation composition, fire also increases the frequency of sheet flow and rill formation (Naveh, 2016).

The government and the forest department of Mississippi State in USA had learned from their practical experiment, the effects and benefits of prescribed burning. Before acquiring all these knowledge, they have lost most of their natural forest to fire. They learned that fire is created with a set of goals and in a controlled manner will be the best tool for forest management, but it is cautioned regarding the creation of public nuisance due to this activities. Ten Southern states of Mississippi State in USA have passed laws to define prescribed burning as a legal activity with ecological and social benefits (Brasher, 2019)

III. SOFTWARE REQUIREMENT SPECIFICATION

3.1 INTRODUCTION:

Forest fire is a hysterical fire occurring in a vegetation and it may spread rapidly resulting in fierce blowups and shoulder the physiognomies of a fire storm. Fire has a prodigious capability to rescind the unabridged shrubbery cover but the fared burning or prescribed burning can rejuvenate landscapes, facilitates crop production, pest control and prevents disastrous effects

Among different types of benefits from using prescribed burning as a forest resource management tools, reduction of hazardous fuels, preparation of sites for seeding or planting, improvement of wildlife habitat, disposal of logging debris, disease control and many others benefits are gained by means of prescribed burning method. Fire has played a major role in shaping the forest ecosystems. Some of the regenerations are dependent on burning and others are prone to burning which ultimately leads to extinction of local species and trigger substantial changes in the ecosystems.

3.1.2Project scope

1. Provide Information about Fire.
2. Help to prevent Forest Fire.

3.Main Aim of This System is to save the all possible lifes due to Forest fire

3.1.3User classes and Characteristics

1.User can go into system using web browser.
2.User can give location as a input to the system .
3.User can Interact with system

3.1.4 Assumptions and Dependencies

1.User get satisfying result from system.
2.User can interact with every possible location.
3.Strong Prediction of Forest Fire Occurrence.

3.1 FUNCTIONAL REQUIREMENTS

3.2.1System feature:

- 24x7 Support
- Every Type of user can use it.
- Platform independent system

3.2 EXTERNAL INTERFACE REQUIREMENT

3.3.1User Interface Location

3.3.3 Software Interfaces

Communication interface as a GUI

3.4 Non-functional Requirements

3.4.1Performance Requirements

Performance requirements for proposed system are as follows, System will perform if proper database is been provided

3.4.2Safety Requirements

No safety requirements is been needed as our system is purely software oriented

3.4.3Security Requirements

No safety requirement of Security it is fully open source.

3.4.4Software Quality Attributes

- **Correctness:** System is planned in such way that it will give most correct output
- **Reusable:** This software is reusable.
- **Portable:** It is a webApplication based so its introduces portability.
- Also system satisfies other quality attributessuch asreliability, interoperability, maintainability, and flexibility

3.5 SYSTEM REQUIREMENT

3.5.1 SYSTEM REQUIREMENT

- CSV

3.5.2Software Required

1. Google Collab.

2.Libraries:

Streamlit pandas matplotlib

sklernt.linear model

3.Anaconda navigator(3)

4.Python 3.8.8

5.Pycharm or Vscode

5.3.3Hardware Required

1. Any System That Supports GPS
2. With Strong Internet Connectivity

3.Any Web Browser

3.6ANALYSIS MODEL: SDLC MODEL

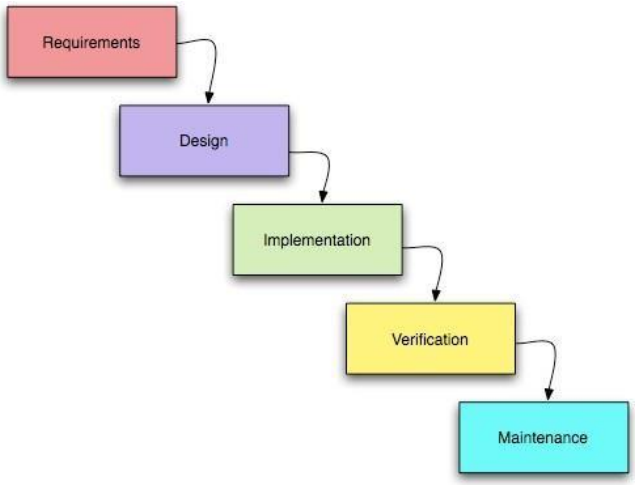


Figure 3.1: Waterfall model

4.1 SYSTEM ARCHITECTUE

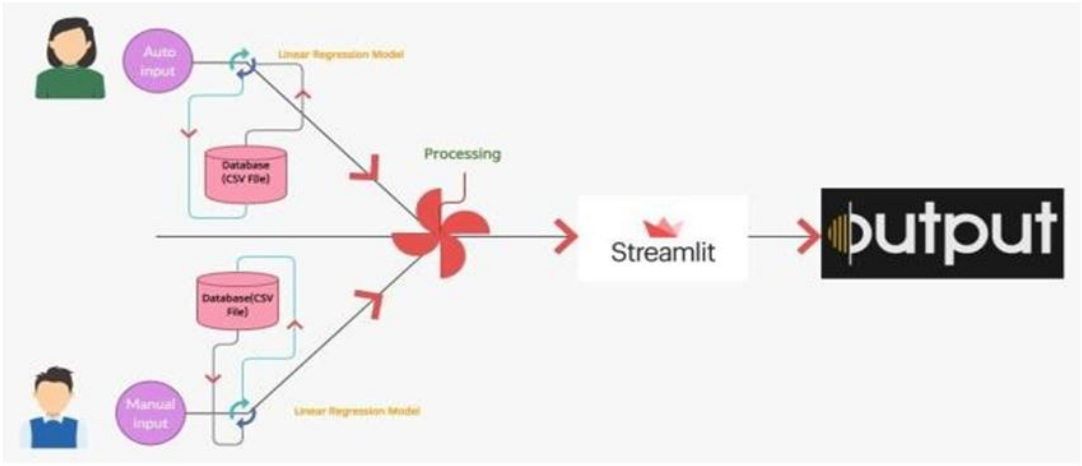
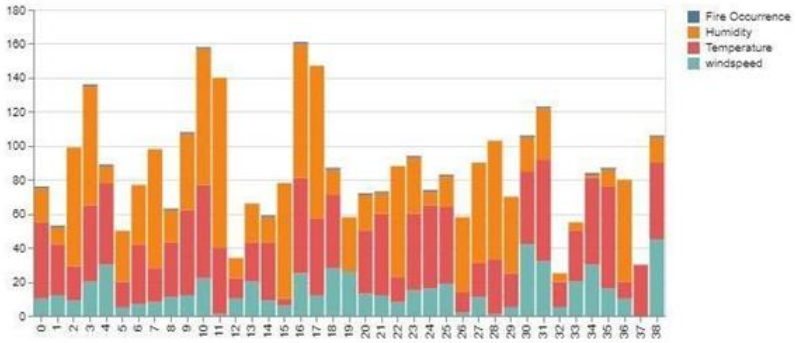


Figure 4.1: System Architecture



4.2PROPOSED ALGORITHM:

Step 1: Initiate
Step 2: Get the Location from User
Step 3: From location get Wind Speed, Temperature, and Humidity**.**
Step 4.analyse the input data
Step 5: Compare input data with previous data for response purpose
Step 6:
if
there is chances of fire occurrence in forest it shows forest in danger else
it shows forest is Safe
Step 7: Give response to User
Step 8: For another Forest Location Step 9: follow step 2 to step 7
Step 10: Stop

4.3DATA FLOW DIAGRAM
4.3.1DATA FLOW DIAGRAM

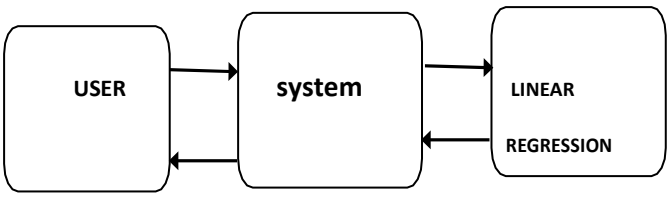


Figure 4.2: DFD Level 0

4.3.2DFD Level 1

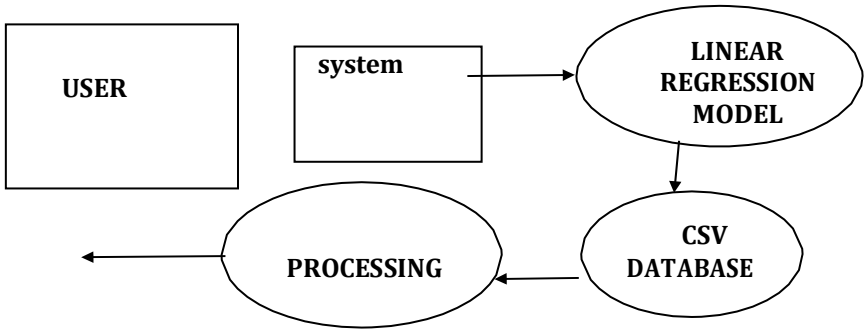


Figure 4.3: DFD Level 1

4.3.1 DFD Level 2

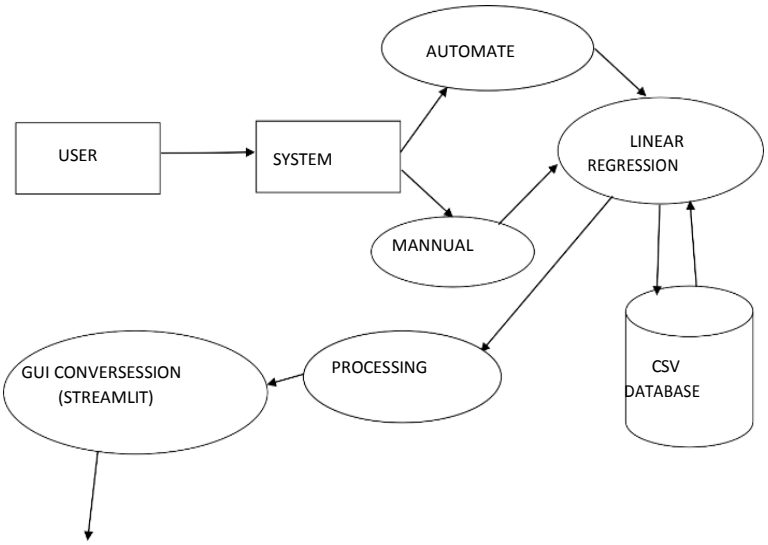


Figure 4.4: DFD Level 2

OTHER SPECIFICATIONS

Advantages

.By Early Predicting the fire occurrence we saves Too Many Lifes .
.Saves The Nature.
.When fire is occur Oxygen level is low, by early prediction
.we can able to face and stopthe fire in forest and saves oxygen also .
.Nature providing different types of gift to us, now it's our time to give gift to nature bysaving it from natural fire.

Application

.In Forest Departments
.In Forest

IV. CONCLUSION

Forest Fire Prediction has been proposed by using linear regression and dividing the datasets according to Fire Occurrences. The algorithm achieves most accurate result. The beauty of the algorithm lies in the way that it can give the resultfor saving the nature. In future, this approach can be extended by for other disastersas well. Application of certain transformation might also improve the model efficiency. As well we are able to fight with natural fire occurrence in forest and saves the life's of animals.

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