PROJECT SYNOPSIS
ON

"Maharashtra weather data prediction using machine learning and deep learning integrated with power bi dashboard"

This synopsis is submitting to

G.H. Raisoni College of Engineering

In partial fulfilment of the requirement for the award of Degree of **Bachelor**

of Technology in Information Technology

SUBMITTED BY
ARPIT TAMRAKAR
GAURAV BARANGE
GUNWANT SONKUSARE
ANIKET NEHARE

GUIDED BY
PRAVIN JARONDE

G H Raisoni College of Engineering, Nagpur
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Certificate

The project synopsis entitled as "**Maharashtra weather data prediction using machine learning and deep learning integrated with power bi dashboard"** submitted by **Arpit Tamrakar, Gaurav Barange , Gunwant Sonkusare and Aniket Nehare** for the award of Degree of Bachelor of Technology in **Information Technology** has been carried out under my supervision.

Prof. Pravin Jaronde
Guide
Assistant Professor
Department of Information Technology
G H R C E, Nagpur

Prof. Sonali Guhe
Project Incharge
Assistant Professor
Department of Information Technology
G H R C E, Nagpur

Dr. Mahendra Gaikwad
Head of Department
Information Technology
G H R C E, Nagpur

Dr. Sachin Untawale
Director
G H R C E, Nagpur

INDEX

ABSTRACT

The project aims to create an advanced weather forecasting system for Maharashtra, employing machine learning (ML) and deep learning (DL) algorithms and integrating them into a Power BI dashboard. The endeavor encompasses several stages: data compilation from meteorological sources for all districts in maharashtra, followed by meticulous preprocessing to handle anomalies. Subsequently, a Power BI dashboard is constructed, illustrating the amalgamated average values of historical weather data for comprehensive analysis. The primary focus then shifts to ML-based forecasting using Autoregressive Integrated Moving Average (ARIMA) for a sample district, optimizing hyperparameters for accurate predictions.

This abstract of our project focuses on the development of an innovative Crowdfunding Application, leveraging the transformative potential of web3 and blockchain technologies. With a central focus on fortifying robust security measures, ensuring seamless global accessibility, and establishing unparalleled transparency, the platform aspires to revolutionize the conventional landscape of crowdfunding practices. The user experience is elevated through an inherently intuitive interface, further enriched by the provision of comprehensive educational resources. These resources empower users, offering an in-depth understanding of the intricate workings of web3 and blockchain. The project's inherently scalable design not only ensures the efficient fundraising of diverse global projects but also positions itself as a pivotal force, poised to reshape the future of crowdfunding into a secure, transparent, and globally inclusive ecosystem.

1. INTRODUCTION

1.1 BACKGROUND

A area called Maharashtra is situated in the eastern portion of the Indian state of Maharashtra. It is renowned for having a wide range of climates and Rainfall patterns. The area receives calm, pleasant winters as well as scorching, dry summers. The influence of Maharashtra's Rainfall patterns on numerous industries and applications makes it crucial to comprehend and anticipate them properly.

In many fields, such as agriculture, weather forecasting, and resource management, Rainfall prediction is essential. In the agricultural industry, Rainfall forecasting may help farmers choose the right crops, schedule irrigation, and manage pests. Farmers can optimize their methods thanks to accurate Rainfall projections, which increases crop output and reduces resource waste.

Rainfall forecasting is a key component of weather forecasting since it offers crucial data to forecast other meteorological phenomena including rainfall, humidity, and wind patterns. Maharashtra's timely and precise Rainfall forecasts allow meteorologists to offer warnings in advance for extreme weather occurrences, aiding local populations and authorities in risk mitigation.

Effective resource management also benefits from Rainfall data. It helps with energy consumption planning, especially for cooling and heating needs. Accurate Rainfall predictions also help sectors that depend on Rainfall-sensitive activities, including manufacturing, transportation, and infrastructure, to optimise their operations and reduce losses.

However, there are several difficulties and complexity involved in precisely forecasting Rainfalls in the Maharashtra area. Because of the large geographical and temporal fluctuations in the region's climate, it is crucial to take into account regional elements including topography, land use, and microclimates. Maharashtra also experiences monsoons, which bring about seasonal changes and may affect Rainfall patterns. These elements make predicting the region's Rainfall a difficult undertaking that calls for complex modelling methods like deep learning.

1.2 AIM AND OBJECTIVE:

- To create a deep learning model for predicting Rainfall in the Maharashtra area: The development of a deep learning model especially suited for Rainfall prediction in the Maharashtra area is the main goal of this study. To effectively predict future Rainfall trends, the model will make use of previous Rainfall data as well as other pertinent information. The model seeks to capture the temporal relationships and spatial properties found in the Maharashtra dataset by using deep learning techniques like CNN and RNN.

- To evaluate the model's performance utilising information from several Maharashtra districts: Utilising the Maharashtra dataset, another goal is to assess how well the deep learning model performs. In the Maharashtra area, the dataset includes Rainfall data from a number of districts. We can evaluate the model's capability to represent the distinctive Rainfall patterns and regional differences prevalent in Maharashtra by examining its performance across different districts.

- To evaluate the performance of the deep learning model for Rainfall prediction against existing techniques or reference models: A comparison study will be done to determine the efficacy of the suggested deep learning model. The outcomes of the deep learning model will be contrasted with those of standard Rainfall forecast techniques or baseline models. This comparison will shed light on the model's effectiveness as well as any potential advantages over more conventional methods or other machine learning techniques.

1.3 SCOPE OF PROBLEM:

The scope of this research focuses on the Maharashtra region in Maharashtra, India, with specific emphasis on Rainfall prediction using deep learning techniques. The following districts in the Maharashtra region will be included in the dataset: Washim, Yavatmal, Nagpur, Wardha, Chandrapur, Gadchiroli, Gondia, Amravati, Bhandara, Buldhana, and Akola. These districts are representative of the diverse climatic conditions and geographical variations within the Maharashtra region.

The research will utilize historical Rainfall data from these districts to train and evaluate the deep learning model. The specific time period and frequency of the data will depend on the availability and quality of the dataset. Ideally, a significant time span of historical Rainfall data will be considered, such as multiple years or seasons, to capture long-term patterns and variations.

It is important to acknowledge the limitations and constraints of the research. These may include:

- Availability of data: The availability and quality of historical Rainfall data for all the desired districts in the Maharashtra region may vary. Limited or incomplete data could impact the accuracy and reliability of the deep learning model.

- Computational resources: Deep learning models can be computationally intensive and may require significant computational resources, including processing power and memory. The scope of the research should consider the availability of such resources and ensure feasibility within the given constraints.

- Generalizability: While the research aims to develop a Rainfall prediction model for the Maharashtra region, the generalizability of the model to other regions or climatic conditions may be limited. The model's performance and effectiveness may vary when applied to regions outside the Maharashtra area.

2. LITERATURE SURVEY:

Title	Author	Description
Weather Prediction Using Machine Learning (2023)	Mrs Anjali Kadam, Shraddha Idhate, Gauri Sonawane, Rucha Sathe, Poonam Gundale	To predict the weather of a particular place at a specific time is known as Weather Forecasting. It is an application of science and technology. Weather forecast is more helpful for people as it predicts the possibilities of changes in weather conditions.
Weather Prediction Using Machine Learning (2022)	Sana Khan, Mani Mishra Rukaiya Khatoon	This research aims to compare the performance of many machine learning algorithms for predicting weather using weather data. From the collected weather dataset which contains some weather attributes, which are most relevant for weather prediction. In this review, various Machine Learning Techniques have used which includes Naive Bayes Algorithm, Logistic Regression.
Smart Weather Forecasting Using Machine Learning (2020)	A H M Jakaria, Mosharaf Hossain Mohammad Rahman	Traditionally, weather predictions are performed with the help of large complex models of physics, which utilize different atmospheric conditions over a long period of time. These conditions are often unstable because of perturbations of the weather system, causing the models to provide inaccurate forecasts.
Machine learning techniques for weather forecasting	William samuel sanders	The effects of weather permeate nearly every aspect of our everyday lives, from travel to commerce to government. The average U.S. adult consults weather forecasts 115 times per month, for a total of more than 300 billion forecasts used per year (Lazo, Morss, & Demuth, 2009).

3. PROPOSED SYSTEM:

3.1 PROPOSED APPROACH:

The project adopts a data-driven approach to weather forecasting, where historical weather data is collected, preprocessed, and used to train machine learning models. Various algorithms such as linear regression, support vector regression, decision trees, random forests, gradient boosting, and neural networks are explored to develop predictive models capable of capturing the complex spatial and temporal patterns of Maharashtra's weather. Feature engineering techniques such as dimensionality reduction, feature selection, and transformation are employed to extract relevant information from the input data and improve model performance.

3.2 PROPOSED ARCHITECHTURE:

The system architecture is designed to facilitate seamless data flow and integration between different components. It includes modules for data collection, preprocessing, feature engineering, model training, validation, and deployment. Real-time weather observations from meteorological stations and satellite imagery are integrated into the system to provide up-to-date information for model training and validation. Integration with Power BI enables the creation of interactive dashboards for visualizing forecasted weather trends and patterns, allowing stakeholders to explore and analyze the data dynamically.

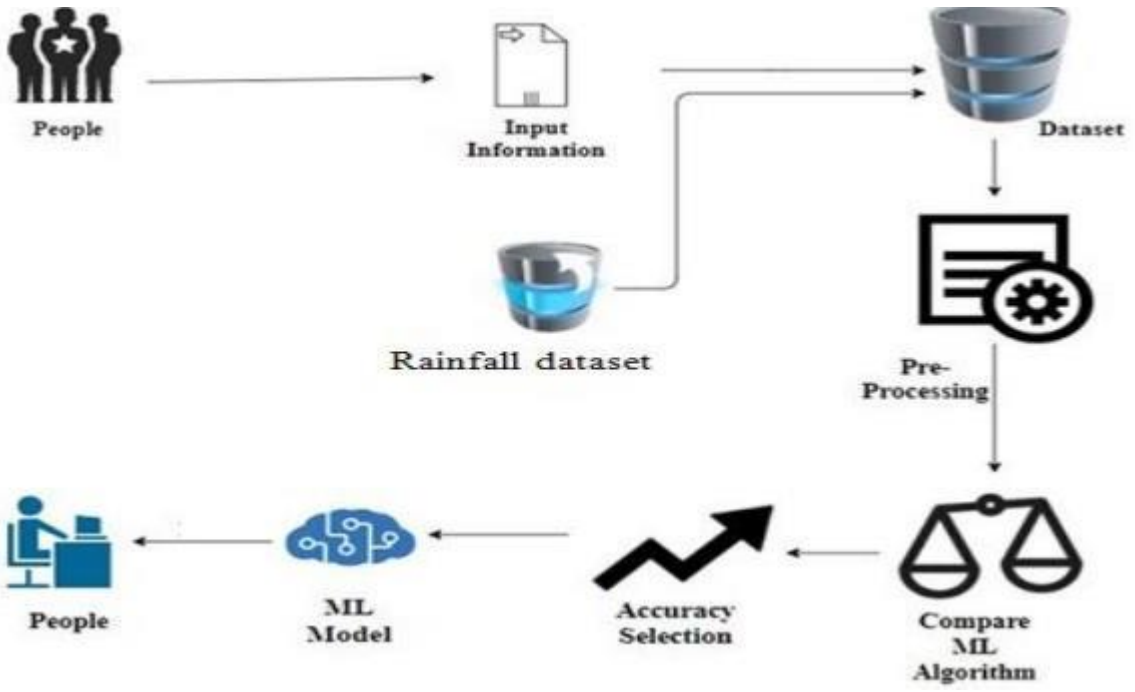

Fig. Architecture

4 PLAN OF RESEARCH WORK:

Sr No	Month	Activity Planned
1	January	Literature survey.
2	February	Data collection and paper publication on literature review.
3	March	Design phase – Data flow analysis.
4	April	Implementation.
5	May	Comparative study and result analysis and thesis writing.
6	May	Thesis writing and paper publication based on implementation.

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