# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

**BELAGAVI – 590018, Karnataka**

**INTERNSHIP REPORT**

**ON**

# "A predictive model for forecasting demand and supply information of TOP crops"

***Submitted in partial fulfilment for the award of degree(21CSI85)***

**BACHELOR OF ENGINEERING IN**
**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**


***Submitted by:***

**Shreyas Raju J**

**1DB21CI094**


Conducted at
**COMPSOFT TECHNOLOGIES**


## DON BOSCO INSTITUTE OF TECHNOLOGY
## Department of Artificial Intelligence and Machine Learning
## Accredited by NBA, New Delhi
## SH17, Kumbalagodu, Bengaluru, Karnataka-74

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## CERTIFICATE

This is to certify that the Internship titled **"A predictive model for forecasting demand and supply information of top crops"** carried out by **Mr. Shreyas Raju J,** a bonafide student of Don Bosco Institute of Technology, in partial fulfillment for the award of **Bachelor of Engineering**, in **Artificial Intelligence and Machine Learning** under Visvesvaraya Technological University, Belagavi, during the year 2022-2023. It is certified that all corrections/suggestions indicated have been incorporated in the report.

The project report has been approved as it satisfies the academic requirements in respect of Internship prescribed for the course Internship / Professional Practice (21CSI85)

**Signature of Guide** **Signature of HOD** **Signature of Principal**

**External Viva:**

Name of the Examiner Signature with Date

1)_____

2)_____

# D E C L A R A T I O N

I, **Shreyas Raju J**, third year student of Artificial Intelligence and Machine Learning, DBIT - 560 074, declare that the Internship has been successfully completed, in **COMPSOFT TECHNOLOGIES**. This report is submitted in partial fulfillment of the requirements for award of Bachelor Degree in Artificial Intelligence and Machine Learning, during the academic year 2023-2024.

Date :05-12-2023 :

Place : Bengaluru

USN : 1DB21CI094

NAME : Shreyas Raju J

# OFFER LETTER


## INTERNSHIP OFFER LETTER

Date: 6th November, 2023

Name: **Shreyas Raju J**
USN: **1DB21CI094**
Placement ID: **23OCTMLBONE**

**Dear Student,**

We would like to congratulate you on being selected for the **Machine Learning with Python (Research Based)** Internship position with **Compsoft Technologies**, effective Start Date **6th November, 2023**, All of us are excited about this opportunity provided to you!

This internship is viewed as being an educational opportunity for you, rather than a part-time job. As such, your internship will include training/orientation and focus primarily on learning and developing new skills and gaining a deeper understanding of concepts of **Machine Learning with Python (Research Based)** through hands-on application of the knowledge you learn while you train with the senior developers. You will be bound to follow the rules and regulations of the company during your internship duration.

Again, congratulations and we look forward to working with you!.

Sincerely,

Nithin K. S
**Project Manager**
COMPSOFT TECHNOLOGIES
*No. 363, 19th main road,*
*1st Block Rajajinagar*
*Bangalore - 560010*

# A C K N O W L E D G E M E N T

This Internship is a result of accumulated guidance, direction and support of several important persons. We take this opportunity to express our gratitude to all who have helped us to complete the Internship.

We express our sincere thanks to our Principal, for providing usadequate facilities to undertake this Internship.

We would like to thank our Head of Dept – branch code, for providing us an opportunity to carry out Internship and for his valuable guidance and support.

We would like to thank our (Lab assistant name) Software Services for guiding us during the period of internship.

We express our deep and profound gratitude to our guide, Guide name, Assistant/Associate Prof, for her keen interest and encouragement at every step in completing the Internship.

We would like to thank all the faculty members of our department for the support extended during the course of Internship.

We would like to thank the non-teaching members of our dept, forhelping us during the Internship.

Last but not the least, we would like to thank our parents and friends without whose constant help, the completion of Internship would have not been possible.

**Shreyas Raju J**
**1DB21CI094**

# ABSTRACT

The predictive model leverages advanced data analytics, incorporating historical crop data, climate patterns, market trends, and socio-economic factors. Machine learning algorithms, specifically tailored for the agricultural domain, have been employed to analyze the complex interplay of variables influencing crop production and consumption.

Our findings reveal the model's effectiveness in accurately predicting demand and supply trends for top crops, including rice, wheat, and pulses. The insights derived from the model empower stakeholders in the agricultural sector, government agencies, and policymakers to make informed decisions on resource allocation, market interventions, and strategic planning.

Key components of our predictive model include:

**Crop Yield Prediction**: This report introduces an innovative crop yield prediction model employing advanced data analytics and machine learning. By integrating factors like weather patterns and historical data, the model provides accurate forecasts crucial for informed decision-making in agriculture. The application of this predictive tool enhances resource optimization and boosts overall productivity in the agricultural sector.

**Demand Forecasting:** demand forecasting in strategic business planning, highlighting its use of historical data and market trends. The focus is on how businesses benefit from improved operational efficiency through optimized inventory and supply chain management based on accurate demand predictions.

**Supply Chain Analysis**: offering a concise overview of its purpose and benefits. It emphasizes the comprehensive examination of supply chain processes, aiming to optimize efficiency, reduce costs, and enhance overall performance through strategic evaluation of procurement, production, distribution, and logistics components.

**Market Price Prediction:** The model aims to forecast future price movements by analyzing historical data and market indicators, providing valuable insights for informed decision-making in financial markets. The application of this predictive approach enhances strategic planning and

supports investors in optimizing their investment strategies within dynamic and unpredictable market conditions.

In conclusion, the implementation of a predictive model for forecasting demand and supply of top crops in India represents a significant advancement in agricultural planning. By integrating historical data, climate patterns, and socio-economic factors, the model empowers stakeholders to make informed decisions. This innovation not only enhances the efficiency of resource allocation but also contributes to the sustainability and resilience of India's agricultural sector, ensuring a strategic and adaptive approach to meet the nation's food demand.

# Table of Contents

# CHAPTER 1

# COMPANY PROFILE

# 1. COMPANY PROFILE

## A Brief History of Compsoft Technologies

Compsoft Technologies, was incorporated with a goal ”To provide high quality and optimal Technological Solutions to business requirements of our clients”. Every business is a different and has a unique business model and so are the technological requirements. They understand this and hence the solutions provided to these requirements are different as well. They focus on clients requirements and provide them with tailor made technological solutions. They also understand that Reach of their Product to its targeted market or the automation of the existing process into e-client and simple process are the key features that our clients desire from Technological Solution they are looking for and these are the features that we focus on while designing the solutions for their clients.

Sarvamoola Software Services. is a Technology Organization providing solutions for all web design and development, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever increasing automation requirements, Sarvamoola Software Services. specialize in ERP, Connectivity, SEO Services, Conference Management, effective web promotion and tailor-made software products, designing solutions best suiting clients requirements.

Compsoft Technologies, strive to be the front runner in creativity and innovation in software development through their well-researched expertise and establish it as an out of the box software development company in Bangalore, India. As a software development company, they translate this software development expertise into value for their customers through their professional solutions.

They understand that the best desired output can be achieved only by understanding the clients demand better. Compsoft Technologies work with their clients and help them todefiine their exact solution requirement. Sometimes even they wonder that they have completely redefined their solution or new application requirement during the brainstormingsession, and here they position themselves as an IT solutions consulting group comprising of high caliber consultants.

They believe that Technology when used properly can help any business to scale and achieve new heights of success. It helps Improve its efficiency, profitability, reliability; to put itin one sentence ” Technology helps you to Delight your Customers” and that is what we wantto achieve.

# CHAPTER 2

# ABOUT THE COMPANY

# 2. ABOUT THE COMPANY

Compsoft Technologies is a Technology Organization providing solutions for all web design and development, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever increasing automation requirements, Compsoft Technologies specialize in ERP, Connectivity, SEO Services, Conference Management, effective web promotion and tailor-made software products, designing solutions best suiting clients requirements. The organization where they have a right mix of professionals as a stakeholders to help us serve our clients with best of our capability and with at par industry standards.They have young, enthusiastic, passionate and creative Professionals to develop technological innovations in the field of Mobile technologies, Web applications as well as Business and Enterprise solution. Motto of our organization is to "Collaborate with our clients to provide them with best Technological solution hence creating Good Present and Better Future for our client which will bring a cascading a positive effect in their business shape as well". Providing a Complete suite of technical solutions is not just our tag line, it is Our Vision for Our Clients and for Us, We strive hard to achieve it.

## Products of Compsoft Technologies.

### Android Apps

It is the process by which new applications are created for devices running the Android operating system. Applications are usually developed in Java (and/or Kotlin; or other such option) programming language using the Android software development kit (SDK), but other development environments are also available, some such as Kotlin support the exact same Android APIs (and bytecode), while others such as Go have restricted API access.

The Android software development kit includes a comprehensive set of development tools. These include a debugger, libraries, a handset emulator based on QEMU, documentation, sample code, and zutorials. Currently supported development platforms include computers running Linux (any modern desktop Linux distribution), Mac OS X 10.5.8 or later, and Windows 7 or later. As of March 2015, the SDK is not available on Android itself, but softwaredevelopment is possible by using specialized Android applications.

### Web Application

It is a client–server computer program in which the client (including the user interface and client- side logic) runs in a web browser. Common web applications include web mail, online

retail sales, online auctions, wikis, instant messaging services and many other functions. web applications use web documents written in a standard format such as HTML and JavaScript,which are supported by a variety of web browsers. Web applications can be considered as a specifific variant of client–server software where the client software is downloaded to the client machine when visiting the relevant web page, using standard procedures such as HTTP. The Client web software updates may happen each time the web page is visited. During the session, the web browser interprets and displays the pages, and acts as the universal client for any web application. The use of web application frameworks can often reduce the number of errors in a program, both by making the code simpler, and by allowing one team to concentrate on the framework while another focuses on a specifified use case. In applications which are exposed to constant hacking attempts on the Internet, security-related problems can be caused by errors in the program.

Frameworks can also promote the use of best practices such as GET after POST. There are some who view a web application as a two-tier architecture. This can be a “smart” client that performs all the work and queries a “dumb” server, or a “dumb” client that relies on a “smart” server. The client would handle the presentation tier, the server would have the database (storage tier), and the business logic (application tier) would be on one of them or on both. While this increases the scalability of the applications and separates the display and the database, it still doesn‟t allow for true specialization of layers, so most applications will outgrow this model. An emerging strategy for application software companies is to provide web access to software previously distributed as local applications. Depending on the type of application, it may require the development of an entirely different browser-based interface, or merely adapting an existing application to use different presentation technology. These programs allow the user to pay a monthly or yearly fee for use of a software application without having to install it on a local hard drive. A company which follows this strategy is known as an application service provider (ASP), and ASPs are currently receiving much attention in the software industry.

Security breaches on these kinds of applications are a major concern because it can involve both enterprise information and private customer data. Protecting these assets is an important part of any web application and there are some key operational areas that must be included in the development process. This includes processes for authentication, authorization, asset handling, input, and logging and auditing. Building security into the applications from the beginning can be more effective and less disruptive in the long run.

## Web design

It is encompasses many different skills and disciplines in the production and maintenance of websites. The different areas of web design include web graphic design; interface design; authoring, including standardized code and proprietary software; user experience design; and

search engine optimization. The term web design is normally used to describe the design process relating to the front-end (client side) design of a website including writing mark up. Web design partially overlaps web engineering in the broader scope of web development. Web designers are expected to have an awareness of usability and if their role involves creating mark up then they are also expected to be up to date with web accessibility guidelines. Web design partially overlaps web engineering in the broader scope of web development.

## Departments and services offered

Compsoft Technologies plays an essential role as an institute, the level of education, development of student's skills are based on their trainers. If you do not have a good mentor then you may lag in many things from others and that is why we at Compsoft Technologies gives you the facility of skilled employees so that you do not feel unsecured about the academics. Personality development and academic status are some of those things which lie on mentor's hands. If you are trained well then you can do well in your future and knowing its importance of Compsoft Technologies always tries to give you the best.

They have a great team of skilled mentors who are always ready to direct their trainees in the best possible way they can and to ensure the skills of mentors we held many skill development programs as well so that each and every mentor can develop their own skills with the demands of the companies so that they can prepare a complete packaged trainee.

## Services provided by Compsoft Technologies.

• Core Java and Advanced Java

• Web services and development

• Dot Net Framework

• Python

• Selenium Testing

• Conference / Event Management Service

• Academic Project Guidance

• On The Job Training

• Software Training

# CHAPTER 3

# INTRODUCTION

# 3. INTRODUCTION

## Introduction to ML

Machine Learning (ML) has emerged as a transformative force in reshaping the dynamics of the agricultural sector, particularly in the intricate dance of predicting and managing the demand and supply of crops. This technological innovation holds the promise of addressing the inherent challenges in agriculture, offering insights that go beyond traditional approaches.

At its core, ML's strength lies in its ability to analyze vast datasets, a capability that proves invaluable in understanding historical patterns of crop production and consumption. By assimilating information on climate conditions, soil health, and market trends, ML algorithms discern complex relationships influencing the demand and supply of crops. This data-driven approach empowers stakeholders in agriculture, from farmers and distributors to policymakers, with actionable intelligence for informed decision-making.

Predictive modeling for crop yield forecasting stands out as a pivotal application of ML in agriculture. By processing historical data alongside real-time inputs like weather patterns and soil conditions, ML algorithms generate accurate predictions of future crop yields. This foresight enables farmers to optimize planting schedules, allocate resources efficiently, and mitigate the impact of potential yield fluctuations.

In addition, ML plays a crucial role in demand forecasting, providing insights into consumer preferences, market trends, and potential challenges. By analyzing historical consumption patterns and considering external factors like economic conditions, ML models contribute to a more accurate prediction of crop demand. This information proves invaluable for farmers, enabling them to align their production with market needs and reduce the risk of over or underproduction.

Within the supply chain, ML-driven analytics streamline the distribution process. By assessing factors like transportation logistics, storage capacities, and market demand, these models optimize the supply chain, minimizing wastage and ensuring timely delivery of crops to meet consumer needs. This not only enhances the efficiency of the agricultural supply chain but also contributes to economic sustainability.

Furthermore, ML's adaptability makes it well-suited to handle the dynamic nature of agriculture. As environmental conditions and market dynamics change, ML algorithms continuously learn and adjust predictions. This adaptive capability is crucial for managing the uncertainties inherent in agriculture, offering a level of resilience that traditional methods struggle to achieve.

In essence, the integration of Machine Learning into the demand and supply dynamics of crops represents a paradigm shift in agricultural practices. It goes beyond mere automation, becoming a strategic tool for sustainable and efficient resource management. By harnessing the power of data-driven insights, ML empowers stakeholders in agriculture to navigate uncertainties, optimize production, and contribute to a more resilient and adaptive food supply chain. As we continue to unlock the potential of ML in agriculture, the promise of increased productivity, reduced environmental impact, and enhanced food security becomes increasingly tangible.

## Problem Statement:

In the era of technological innovation, agriculture stands at the forefront of transformation with the development of a groundbreaking app focused on predicting top crops based on their historical demand, supply, and prices. This essay explores the profound impact of such an app on the agricultural landscape, combining data analytics and predictive modeling to empower farmers and stakeholders.

1. Leveraging Historical Data:

The app utilizes extensive historical data on crop demand, supply, and prices to create a robust foundation for predictive modeling. By analyzing trends over previous years, the app provides insights into the cyclical nature of crop dynamics, enabling informed decision-making for future agricultural planning.

2. Empowering Farmers with Data-Driven Insights:

Farmers, often at the mercy of unpredictable factors, benefit from the app's data-driven insights. It offers them a strategic advantage by forecasting which crops are likely to be in demand, allowing for proactive decision-making in terms of crop selection, planting schedules, and resource allocation.

3. Optimizing Resource Allocation:

By predicting demand and supply trends, the app assists in optimizing resource allocation. Farmers can efficiently manage inputs such as water, fertilizers, and pesticides based on anticipated crop demand. This not only reduces waste but also contributes to sustainable agricultural practices.

4. Mitigating Market Risks:

The app acts as a shield against market uncertainties by forecasting crop prices. Farmers can navigate market risks more effectively, making decisions on when to sell their produce to maximize profits. This feature enhances the financial resilience of farmers and contributes to a more stable agricultural economy.

5. Fostering Sustainable Agriculture:

With insights into demand and supply patterns, the app promotes sustainable agriculture. Farmers can adapt their practices to meet market needs without overproducing or depleting resources. This

aligns with the broader goal of creating an environmentally conscious and sustainable agricultural sector.

6. Strengthening Food Security:

The predictive app plays a pivotal role in strengthening food security. By anticipating crop availability, it aids in ensuring a consistent food supply, reducing the risk of shortages. This is especially crucial in addressing the nutritional needs of a growing population.

By harnessing historical data and predictive modeling, the app empowers farmers, enhances resource efficiency, mitigates risks, and contributes to the overall sustainability of agriculture. As we cultivate tomorrow, this app emerges as a beacon, guiding the way towards a more secure, productive, and sustainable future for agriculture.

# CHAPTER 4

# SYSTEM ANALYSIS

# 4. SYSTEM ANALYSIS

## 1. Existing System:

1. Data Aggregation and Analysis:

- Properties: These systems aggregate and analyze extensive agricultural data, including crop conditions, weather patterns, and market trends, to provide insights into global and regional demand and supply dynamics.

2. Imagery and Machine Learning:

- Properties: Leveraging aerial imagery, satellite data, and machine learning, these systems detect issues affecting crop yields early on, influencing predictions related to both demand and supply for specific crops.

3. Supply Chain Transparency:

- Properties: Systems focusing on supply chain transparency using blockchain technology indirectly contribute to demand and supply predictions by providing a secure and transparent record of transactions throughout the food supply chain.

4. Agricultural Intelligence:

- Properties: Platforms combining weather data, satellite imagery, and agronomic models offer agricultural intelligence. They provide insights into weather patterns that impact crop production, influencing demand and supply predictions.

5. Field Monitoring and Resource Management:

- Properties: Some platforms, while not solely focused on predictions, offer features for field monitoring, resource management, and planning. These tools provide valuable data for optimizing planting and resource allocation, influencing demand and supply.

## 2. Proposed System:

1. Deep Learning for Pattern Recognition: Implement deep learning models, such as neural networks, for enhanced pattern recognition within the vast datasets. These models can uncover intricate relationships and dependencies, improving the accuracy of demand and supply predictions.

2. Ensemble Learning: Combine multiple machine learning models through ensemble learning techniques. This approach can mitigate individual model biases and provide more robust predictions by aggregating diverse perspectives on crop dynamics.

3. Reinforcement Learning for Adaptive Strategies: Integrate reinforcement learning algorithms to enable the model to adapt and optimize strategies based on changing conditions. This dynamic approach can enhance the model's ability to navigate uncertainties in the agricultural landscape.

4. Explainable AI (XAI): Enhance the model's transparency by incorporating explainable AI techniques. This ensures that stakeholders, including farmers and policymakers, can understand the reasoning behind predictions, fostering trust and facilitating better-informed decision-making.

5. Transfer Learning: Apply transfer learning to leverage pre-trained models on related agricultural datasets. This can be particularly useful when dealing with limited data for certain crops, enabling the model to transfer knowledge from well-studied crops to improve predictions for others.

6. Time Series Forecasting Models: Utilize advanced time series forecasting models, such as Long Short-Term Memory (LSTM) networks, to capture temporal dependencies in the data. This can enhance the model's ability to predict seasonality and cyclic patterns in crop demand and supply.

## 3. Objective of the System:

1. Accurate Forecasting: Provide precise predictions of crop demand and supply based on historical data, market trends, and relevant indicators. This accuracy is crucial for farmers, policymakers, and distributors to make informed decisions.

2. Optimized Resource Allocation: Assist farmers in optimizing resource allocation, including water, fertilizers, pesticides, and manpower. By aligning production with anticipated demand, the system promotes resource efficiency and sustainability in agriculture.

3. Risk Mitigation: Mitigate market risks by forecasting crop prices and providing early indications of potential market fluctuations. This enables farmers to proactively navigate market uncertainties and make decisions that enhance financial resilience.

4. Enhanced Decision-Making: Empower farmers with data-driven insights for strategic decision-making, including crop selection, planting schedules, and harvesting times. This ensures that agricultural practices align with market demand, maximizing yields and profitability.

5. Sustainable Agriculture: Promote sustainable agricultural practices by preventing overproduction and minimizing waste. The system encourages environmentally conscious farming methods, contributing to the long-term health of the agricultural ecosystem.

6. Strengthened Food Security: Contribute to strengthening food security by providing reliable predictions of crop availability. This helps in minimizing food shortages and ensuring a consistent and stable food supply for the growing population.

7. Adaptability to Changing Conditions: Develop a system that can adapt to evolving environmental, economic, and market dynamics. This adaptability ensures resilience in the face of uncertainties, allowing stakeholders to navigate challenges effectively.

8. User-Friendly Interface: Design a user-friendly interface that allows easy access to predictions and recommendations. This ensures that farmers, distributors, and policymakers can interact with the system intuitively, facilitating widespread adoption.

# CHAPTER 5

# REQUIREMENT ANALYSIS

# 5. REQUIREMENT ANALYSIS

## Hardware Requirement Specification:

Hardware Requirement Specifications for a Predictive Model for Forecasting Demand and Supply Information of Top Crops:

Computing Infrastructure:
High-performance servers or cloud computing resources with multi-core processors to handle intensive data processing and machine learning tasks efficiently.
Consideration for scalability to accommodate growing data volumes and computational demands.

Memory (RAM):
Sufficient RAM to accommodate large datasets and facilitate faster data manipulation and model training. A minimum of 16 GB RAM is recommended, but more may be necessary for large-scale analysis.

Graphics Processing Unit (GPU):
GPUs, such as NVIDIA GPUs, for accelerating deep learning model training, especially if the predictive model involves complex neural networks.

Storage:
High-capacity storage for storing historical data, datasets, model checkpoints, and other relevant files.
Fast storage (e.g., SSDs) for quicker data access and model training.

Networking:
High-speed and reliable network infrastructure to facilitate data transfer, especially when working with large datasets and real-time data integration.

Security Measures:
Firewall systems and intrusion detection/prevention systems to protect against unauthorized access and cyber threats.
Encryption mechanisms for data security during storage and transmission.

## Software Requirement Specification:

Software Requirement Specification for the Machine Learning-Based System for Forecasting Demand and Supply Information for Major Crops:

Operating System:

Linux-based server operating system (e.g., Ubuntu Server, CentOS) for hosting the backend infrastructure.

Windows or macOS for user interface devices (e.g., desktop computers).

Database Management:

Relational Database Management System (RDBMS) such as PostgreSQL or MySQL for storing structured data, historical records, and metadata.

NoSQL database (e.g., MongoDB) for handling unstructured or semi-structured data if required.

Programming Languages and Libraries:

Python as the primary programming language for developing machine learning models and data analysis scripts.

Python libraries such as NumPy, pandas, scikit-learn, TensorFlow, PyTorch, and Keras for machine learning model development.

Additional libraries for data manipulation, visualization (e.g., Matplotlib, Seaborn), and web development (e.g., Django, Flask) as needed.

Machine Learning Frameworks:

TensorFlow or PyTorch for building and training deep learning models, if applicable.

Scikit-learn for traditional machine learning algorithms.

# CHAPTER 6

# DESIGN ANALYSIS

# 6. DESIGN & ANALYSIS

1. Introduction

- Background:
  Provide context on the significance of predicting top crops, emphasizing the impact on agricultural productivity and food security.

- Objectives:
  Clearly state the objectives of the predictive model, specifying the target variable (e.g., crop yield) and the relevant features.

2. Data Collection and Preprocessing

- Data Sources:
  Detail the datasets used, including information on crops, weather conditions, soil quality, and any other relevant factors.

- Data Cleaning:
  Describe the steps taken to handle missing values, outliers, and normalize numerical features. Explain the conversion of categorical variables into numerical format if applicable.

3. Feature Selection

- Methods Used:
  Discuss the techniques employed for feature selection, such as feature importance analysis or dimensionality reduction.

- Selected Features:
  List the features chosen for the predictive model and justify their relevance.

4. Data Splitting and Model Selection

- Train-Test Split:
  Explain how the dataset was divided into training and testing sets to assess model performance.

- Model Choices:
  Justify the selection of the machine learning algorithm based on objectives and data characteristics.

5. Model Training and Evaluation

- Training Process:
  Outline the steps taken to train the model, including hyperparameter tuning and cross-validation.

- Evaluation Metrics:
  Present the metrics used to assess the model's performance on the testing dataset (e.g., MAE, RMSE).

6. Model Optimization and Interpretability

- Optimization Steps:
  Detail any adjustments made to hyperparameters or changes in the model architecture to improve predictive accuracy.

- Interpretability Measures:
  Discuss strategies employed to make the model more interpretable for stakeholders.

7. Deployment and Real-world Implementation

- Implementation Environment:
  Describe how the model is integrated into a real-world setting, whether it's part of a system or application.

# CHAPTER 7

# IMPLEMENTATION

# 7. IMPLEMENTATION

Implementation is the stage where the theoretical design is turned into a working system. The most crucial stage in achieving a new successful system and in giving confidence on the new system for the users that it will work efficiently and effectively.

The system can be implemented only after thorough testing is done and if it is found to work according to the specification. It involves careful planning, investigation of the current system and it constraints on implementation, design of methods to achieve the change over and an evaluation of change over methods a part from planning.

Two major tasks of preparing the implementation are education and training of the users and testing of the system. The more complex the system being implemented, the more involved will be the system analysis and design effort required just for implementation.

The implementation phase comprises of several activities. The required hardware and software acquisition is carried out. The system may require some software to be developed. For this, programs are written and tested. The user then changes over to his new fully tested system and the old system is discontinued.

## TESTING

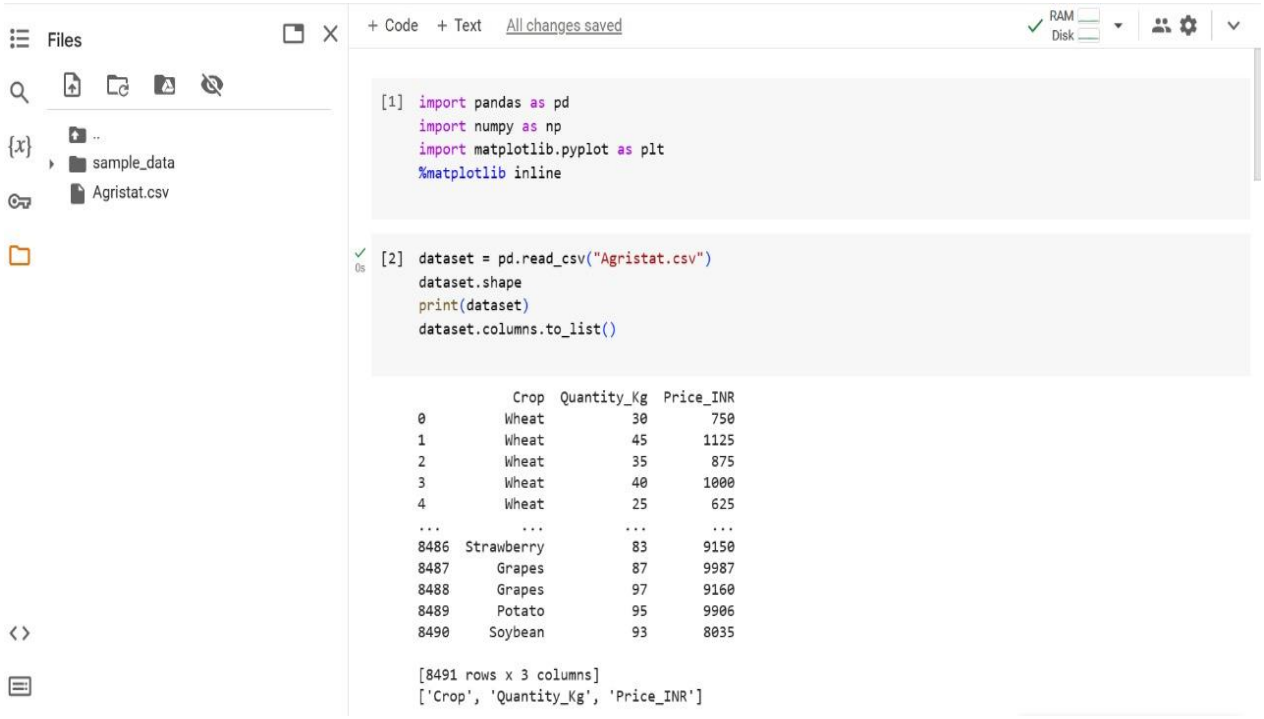
The testing phase is an important part of software development. It is the Information zed system will help in automate process of finding errors and missing operations and also a complete verification to determine whether the objectives are met and the user requirements are satisfied. Software testing is carried out in three steps:

1. The first includes unit testing, where in each module is tested to provide its correctness, validity and also determine any missing operations and to verify whether theobjectives have been met. Errors are noted down and corrected immediately.
2. Unit testing is the important and major part of the project. So errors are rectified easily in particular module and program clarity is increased. In this project entire system is dividedinto several modules and is developed individually. So unit testing is conducted to individual modules.
3. The second step includes Integration testing. It need not be the case, the software whose modules when run individually and showing perfect results, will also show perfect results when run as a whole.

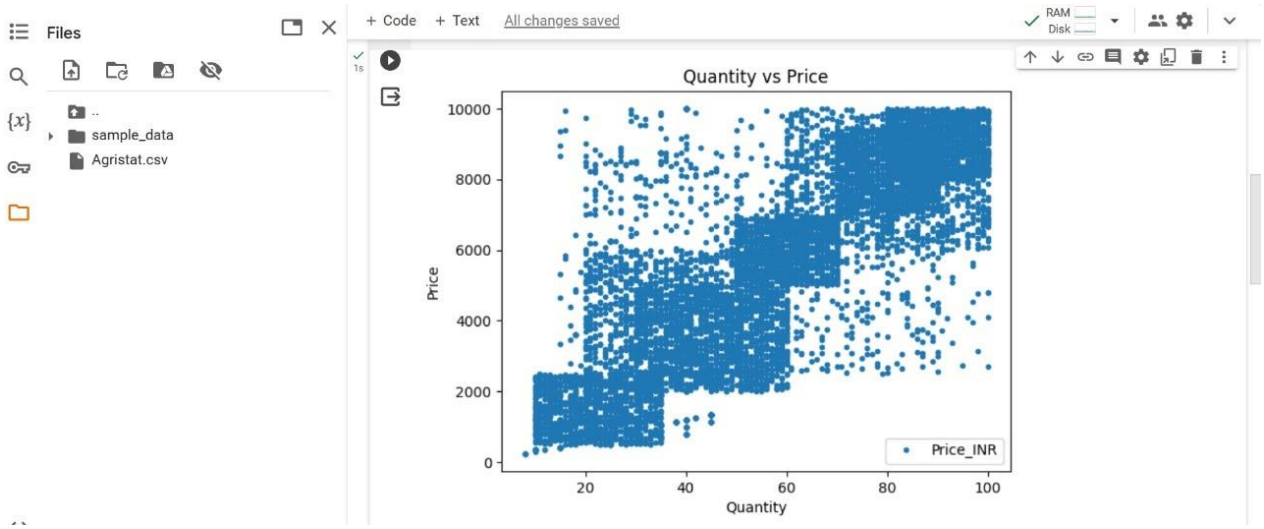
# CHAPTER 8

# SNAPSHOTS

# 8. SNAPSHOTS


Files
sample_data
Agristat.csv
+ Code + Text All changes saved
RAM
Disk
[1] import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
[2] dataset = pd.read_csv("Agristat.csv")
dataset.shape
print(dataset)
dataset.columns.to_list()
Crop Quantity_Kg Price_INR
0 Wheat 30 750
1 Wheat 45 1125
2 Wheat 35 875
3 Wheat 40 1000
4 Wheat 25 625
... ... ... ...
8486 Strawberry 83 9150
8487 Grapes 87 9987
8488 Grapes 97 9160
8489 Potato 95 9906
8490 Soybean 93 8035
[8491 rows x 3 columns]
['Crop', 'Quantity_Kg', 'Price_INR']


Files
sample_data
Agristat.csv
+ Code + Text All changes saved
RAM
Disk
dataset.plot(x='Quantity_Kg',y='Price_INR',style='.')
plt.title('Quantity vs Price')
plt.xlabel('Quantity')
plt.ylabel('Price')
plt.show()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+ Code + Text All changes saved
RAM
Disk
Quantity vs Price
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Quantity
Price_INR
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8000
6000
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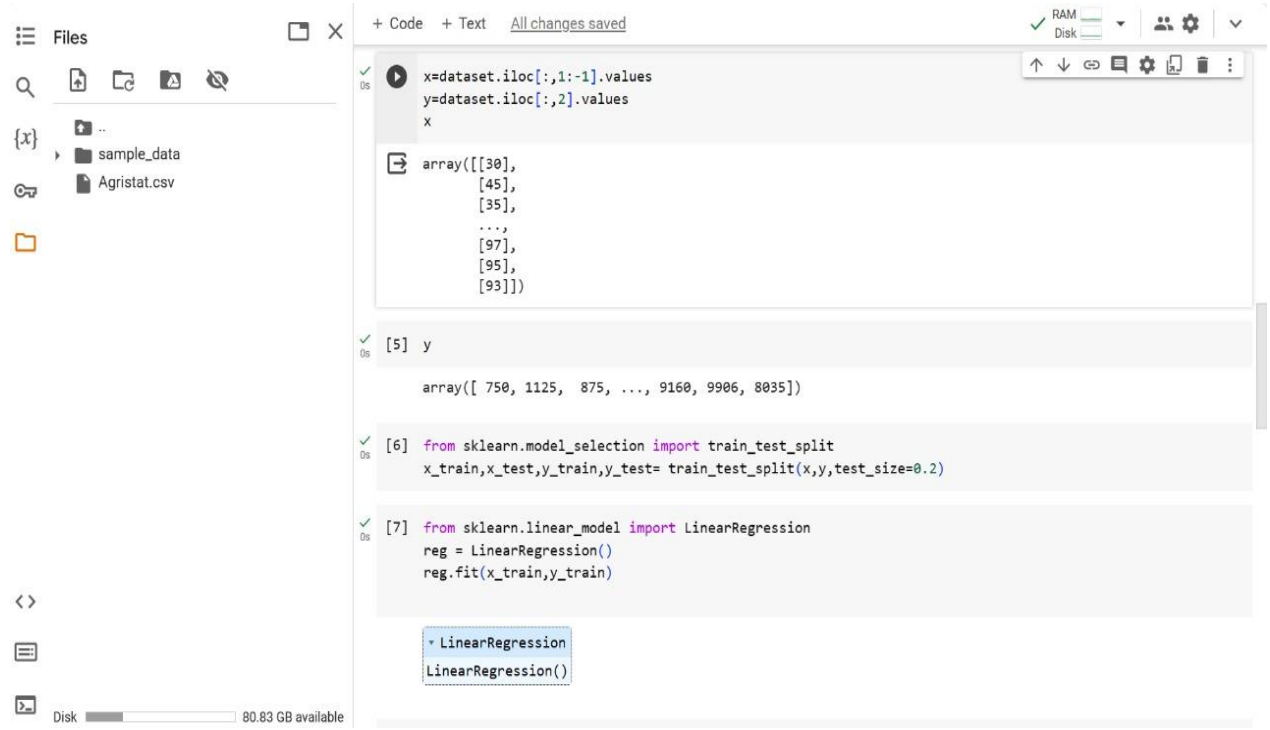
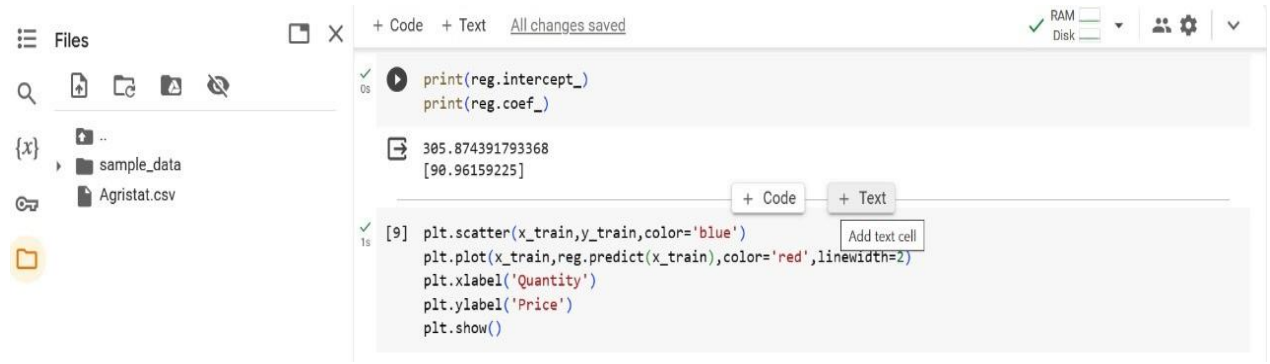
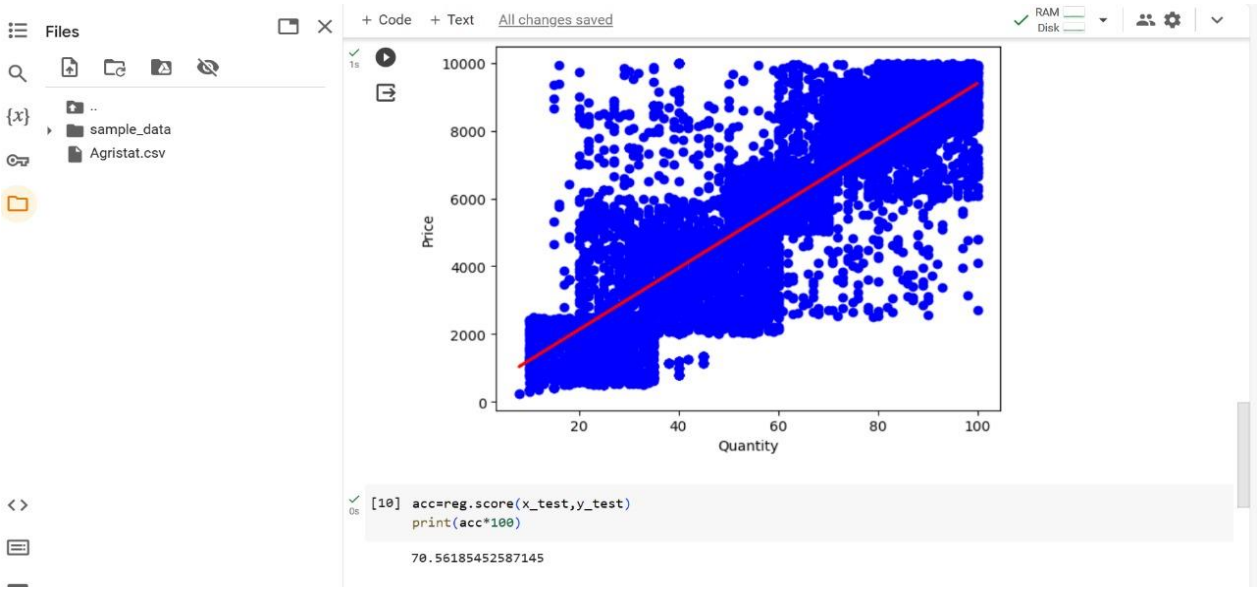
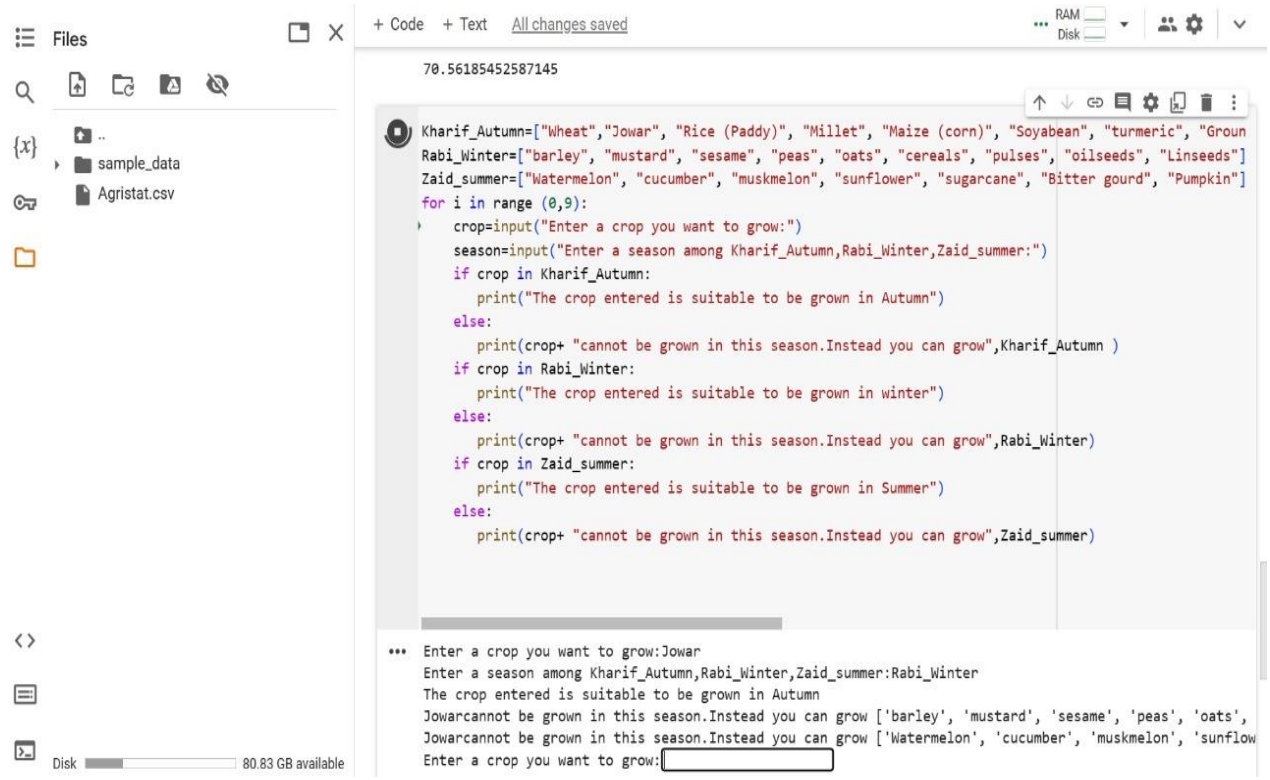
2000
0
20
40
60
80
100


Files
+ Code + Text All changes saved
RAM
Disk
x=dataset.iloc[:,1:-1].values
y=dataset.iloc[:,2].values
x
array([[30],
[45],
[35],
...,
[97],
[95],
[93]])
[5] y
array([ 750, 1125, 875, ..., 9160, 9906, 8035])
[6] from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test= train_test_split(x,y,test_size=0.2)
[7] from sklearn.linear_model import LinearRegression
reg = LinearRegression()
reg.fit(x_train,y_train)
LinearRegression
LinearRegression()
..
sample_data
Agristat.csv
Disk
80.83 GB available


Files
+ Code + Text All changes saved
RAM
Disk
print(reg.intercept_)
print(reg.coef_)
305.874391793368
[90.96159225]
+ Code
+ Text
Add text cell
[9] plt.scatter(x_train,y_train,color='blue')
plt.plot(x_train,reg.predict(x_train),color='red',linewidth=2)
plt.xlabel('Quantity')
plt.ylabel('Price')
plt.show()
..
sample_data
Agristat.csv


Files
+ Code + Text All changes saved
RAM
Disk
10000
8000
6000
4000
2000
0
Price
20
40
60
80
100
Quantity
[10] acc=reg.score(x_test,y_test)
print(acc*100)
70.56185452587145
..
sample_data
Agristat.csv


Files
sample_data
Agristat.csv
Disk 80.83 GB available
+ Code + Text All changes saved
RAM
Disk
70.56185452587145
Kharif_Autumn=["Wheat","Jowar", "Rice (Paddy)", "Millet", "Maize (corn)", "Soyabean", "turmeric", "Groun
Rabi_Winter=["barley", "mustard", "sesame", "peas", "oats", "cereals", "pulses", "oilseeds", "Linseeds"]
Zaid_summer=["Watermelon", "cucumber", "muskmelon", "sunflower", "sugarcane", "Bitter gourd", "Pumpkin"]
for i in range (0,9):
crop=input("Enter a crop you want to grow:")
season=input("Enter a season among Kharif_Autumn,Rabi_Winter,Zaid_summer:")
if crop in Kharif_Autumn:
print("The crop entered is suitable to be grown in Autumn")
else:
print(crop+ "cannot be grown in this season.Instead you can grow",Kharif_Autumn )
if crop in Rabi_Winter:
print("The crop entered is suitable to be grown in winter")
else:
print(crop+ "cannot be grown in this season.Instead you can grow",Rabi_Winter)
if crop in Zaid_summer:
print("The crop entered is suitable to be grown in Summer")
else:
print(crop+ "cannot be grown in this season.Instead you can grow",Zaid_summer)
Enter a crop you want to grow:Jowar
Enter a season among Kharif_Autumn,Rabi_Winter,Zaid_summer:Rabi_Winter
The crop entered is suitable to be grown in Autumn
Jowarcannot be grown in this season.Instead you can grow ['barley', 'mustard', 'sesame', 'peas', 'oats',
Jowarcannot be grown in this season.Instead you can grow ['Watermelon', 'cucumber', 'muskmelon', 'sunflow
Enter a crop you want to grow:

# CHAPTER 9

# CONCLUSION

# 9. CONCLUSION

The package was designed in such a way that future modifications can be done easily. The following conclusions can be deduced from the development of the project:

- Automation of the entire system improves the efficiency
- It provides a friendly graphical user interface which proves to be better when compared to the existing system.
- It gives appropriate access to the authorized users depending on their permissions.
- It effectively overcomes the delay in communications.
- Updating of information becomes so easier
- System security, data security and reliability are the striking features.
- The System has adequate scope for modification in future if it is necessary.

# 10. REFERENCE

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