PRESENTING

MINOR PROJECT

PROBLEM SOLVED:
DYNAMIC CROP PRICE PREDICTION

Chaning how it works

PROBLEM STATEMENT

The problem we are working on is Dynamic Crop Price Predictions. Our objectives can be said as follows:

- Utilizing historical price data for training the predictive models.
- Implementing advanced neural network algorithms, particularly RNN-based architectures, to effectively capture the time-series nature of the data.
- Evaluating the performance of the models using standard regression metrics to ensure reliability and accuracy.

OUR PROJECT

THE PROJECT AIMS TO DEVELOP A DYNAMIC CROP PRICE PREDICTION SYSTEM BASED ON TIME SERIES DATA.

It is due to the pressing need for accurate forecasting in agricultural economics, particularly focusing on predicting crop prices. Predicting future crop prices can empower farmers to make informed decisions about planting, harvesting, and selling their crops.

BASIC CONCEPTS USED

NEURAL NETWORK TECHNIQUES

- ❏ Recurrent Neural Network(RNN)
- ❏ Bidirectional RNN
- ❏ Long Short Term Memory Networks (LSTM)
- ❏ Bidirectional LSTM
- ❏ Gated Recurrent Unit (GRU)
- ❏ Bidirectional GRU

DATA PRE PROCESSING

- ❏ MinMax Scaling

LOSS FUNCTION

- ❏ Huber Loss

IMPLEMENTATION

DATA SET OVERVIEW

Dataset Overview: Varanasi District

- **Source:** Data extracted from agmarket.gov.in
- **Time Dependency:** Preserve during train-test-split
- **Unit:** Rs/Quintal (Modal price)
- **Commodity:** Wheat

Observations:

- **Time Period:** 20 years (2003-2023)
- **Price Trends:**
  - Annual average wheat price consistently increases, except for 2021 (due to pandemic).
  - Significant price hikes post-2020.
- **Price Spikes:**
  - Notable spikes observed in 2005, 2006, 2012, 2013, and 2020, possibly due to elections.
- **Seasonal Patterns:**
  - Prices tend to fall during May-June.

IMPLEMENTATION CONT.

METHODOLOGY

The project employs various RNN architectures, including classical RNN, LSTM, GRU, Bidirectional RNN, Bidirectional LSTM, and Bidirectional GRU, for price prediction. Steps are:

- Data cleaning is performed before uploading the dataset which includes removal of the 0 values
- Data preprocessing steps such as scaling of features using MinMaxScaler.
- Converting the data in form of time series format by converting it into vectors
- Division of the dataset into training and testing sets.
- Training of the models using historical price data.
- Evaluation of model performance using standard regression metrics like Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE).
- Plotting Actual vs Predicted value for visual proofing

IMPLEMENTATION CONT.

TESTING

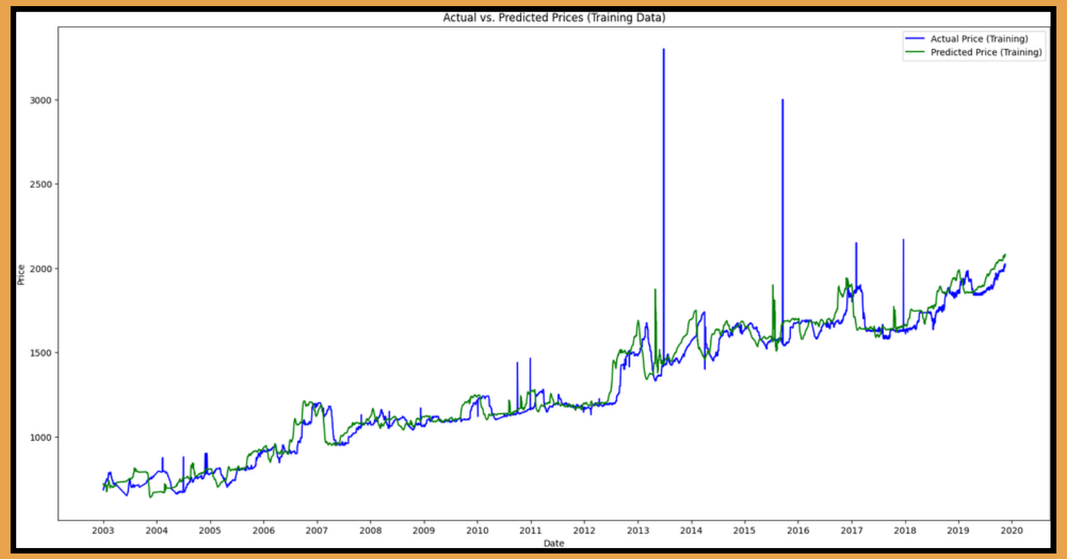
Testing involves validating the trained models on unseen data to assess their generalization capabilities. Before testing we have to un-scale the scaled predicted values. The verification criteria include:

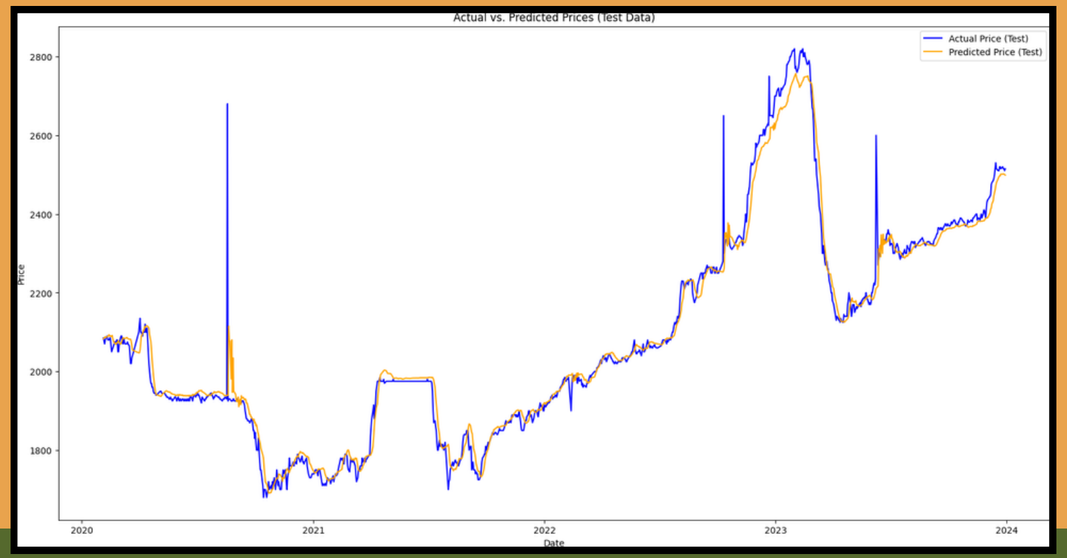
- ❏ Mean Squared Error(MSE)
- ❏ Mean Absolute Error(MAE)
- ❏ Root Mean Square Error(RMSE)
- ❏ R2 Score

RESULTS

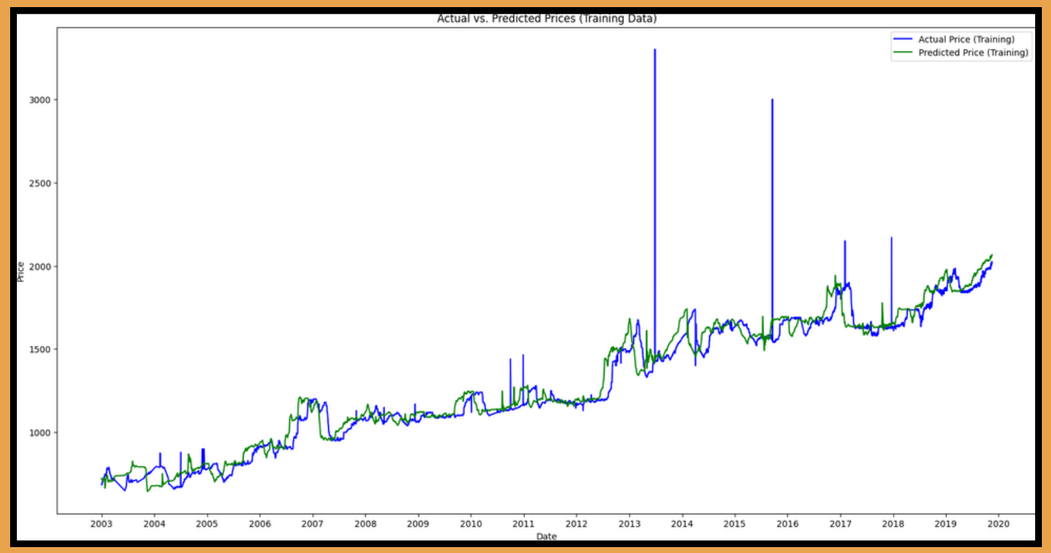
Overall, the project lays a solid foundation for leveraging neural network techniques to address challenges in agricultural economics, with potential applications beyond crop price prediction. For each model we have two graphs: one for training data and one for testing data. Each graph is the comparison of Actual data vs Predicted data.

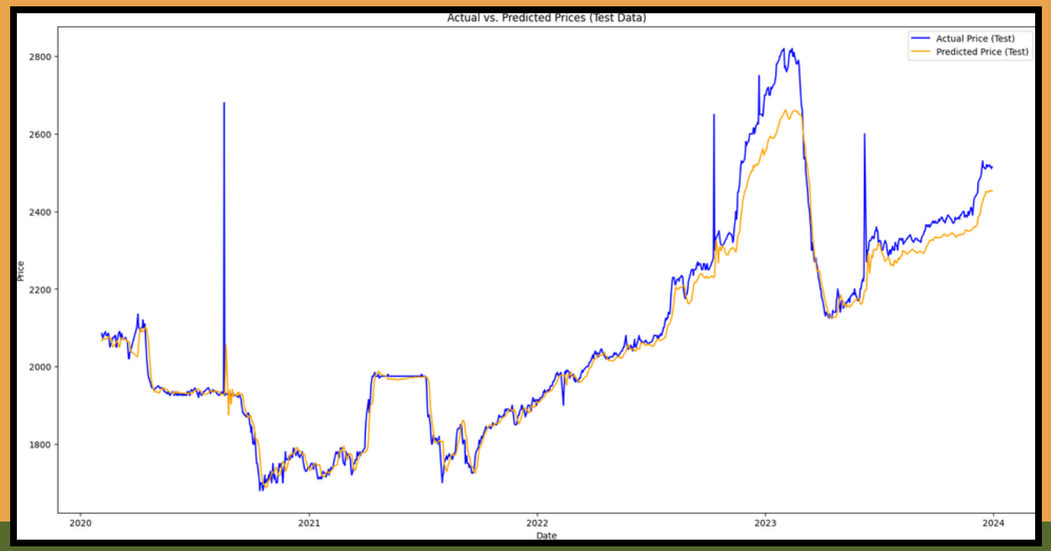
RNN


Actual vs. Predicted Prices (Training Data)
Actual Price (Training)
Predicted Price (Training)
Price
Date

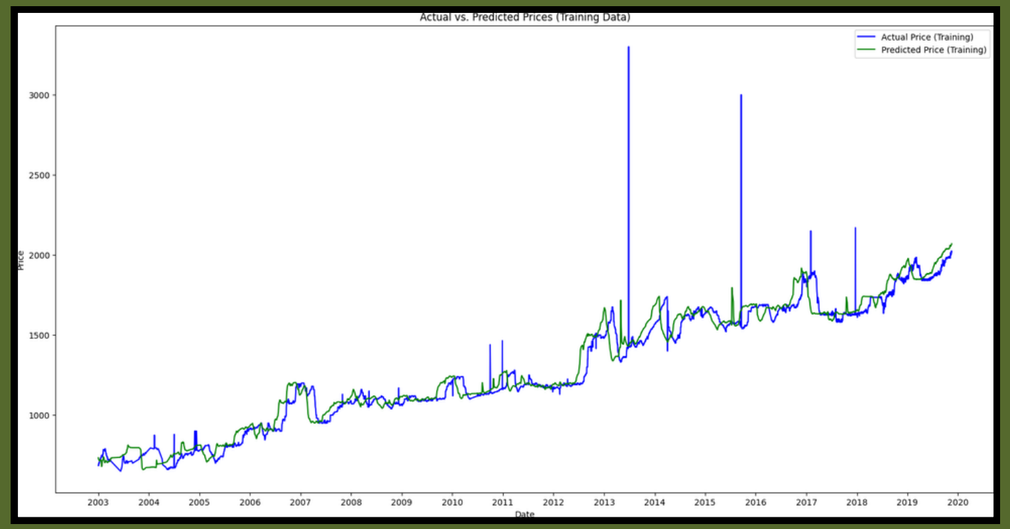

Actual vs. Predicted Prices (Test Data)
Actual Price (Test)
Predicted Price (Test)
Price
Date

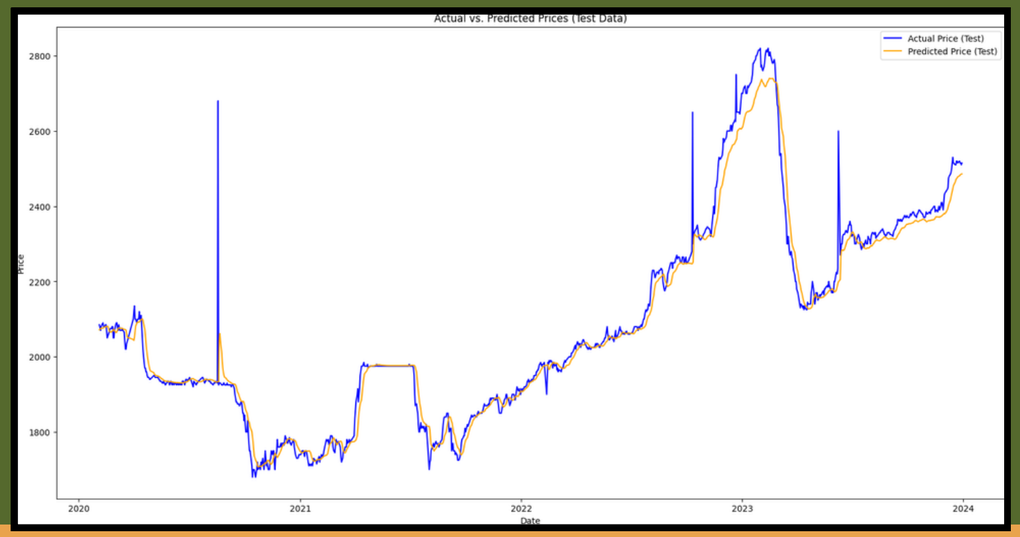
BI RNN


Actual vs. Predicted Prices (Training Data)
Actual Price (Training)
Predicted Price (Training)
Price
Date

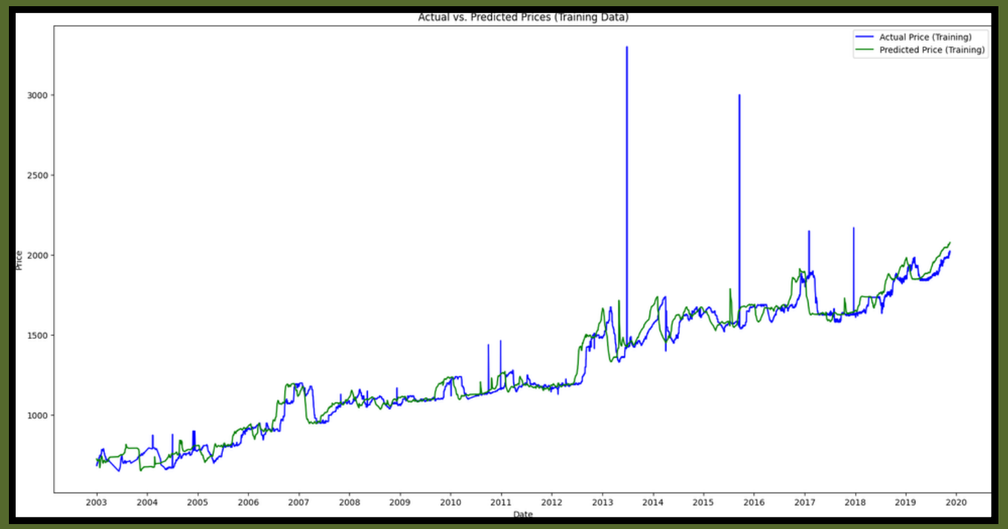

Actual vs. Predicted Prices (Test Data)
Actual Price (Test)
Predicted Price (Test)
Price
Date

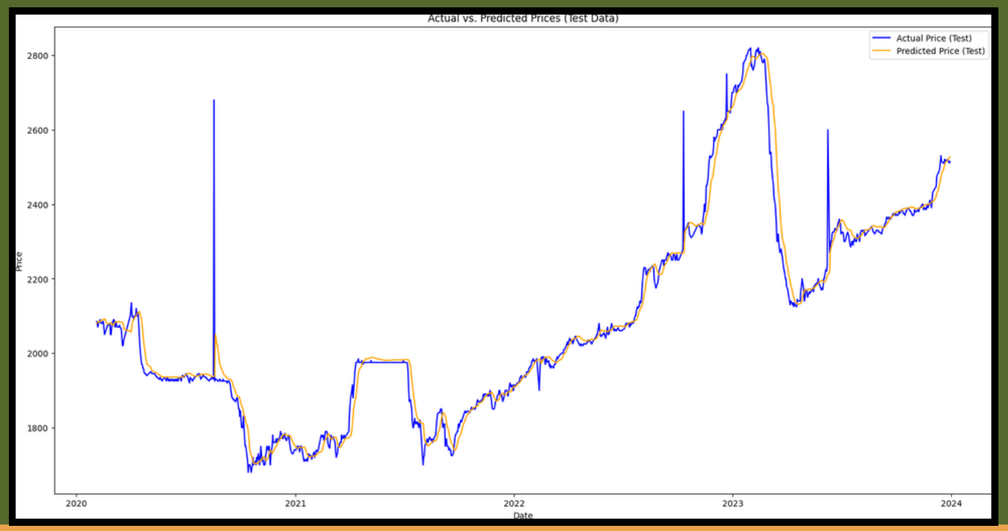
LSTM


Actual vs. Predicted Prices (Training Data)
Actual Price (Training)
Predicted Price (Training)
Price
Date

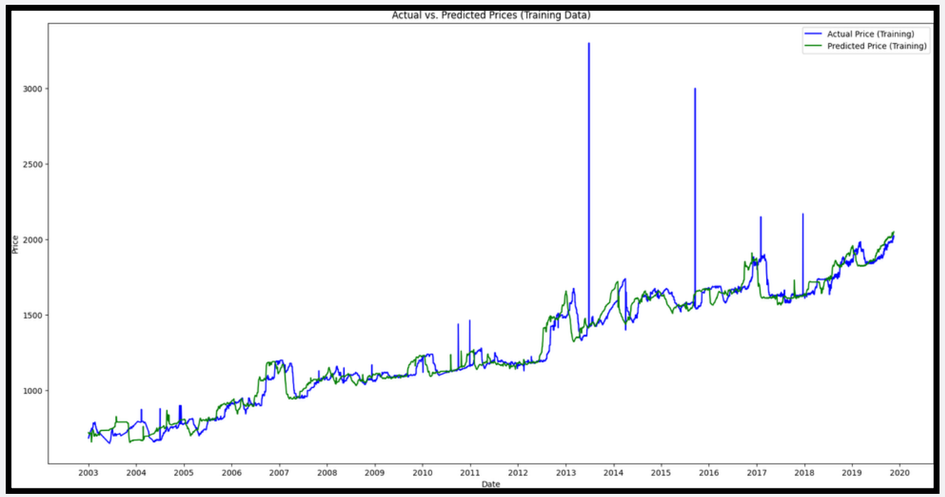

Actual vs. Predicted Prices (Test Data)
Actual Price (Test)
Predicted Price (Test)
Price
Date

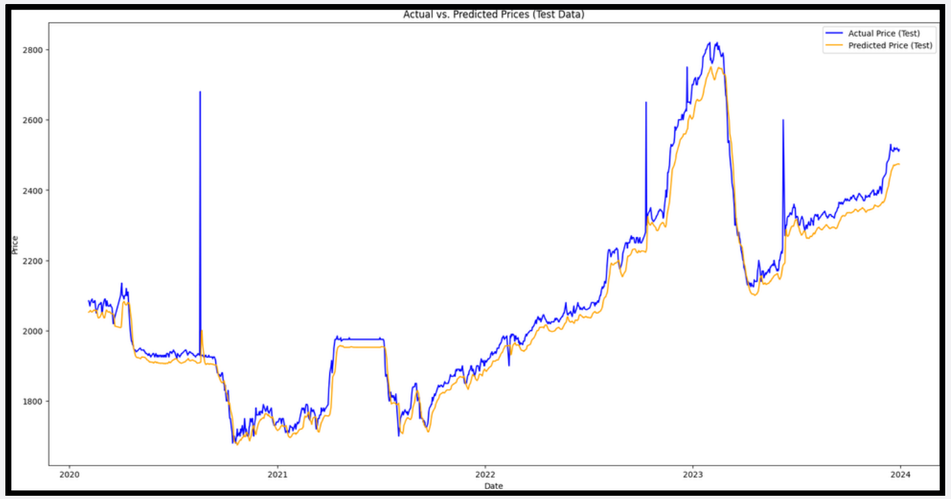
BI-LSTM


Actual vs. Predicted Prices (Training Data)
Actual Price (Training)
Predicted Price (Training)
Price
Date

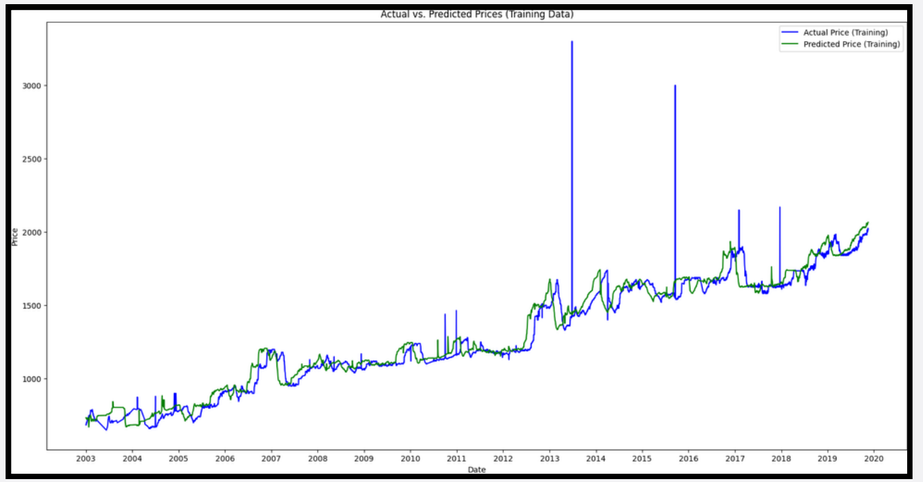

Actual vs. Predicted Prices (Test Data)
Actual Price (Test)
Predicted Price (Test)
Price
Date

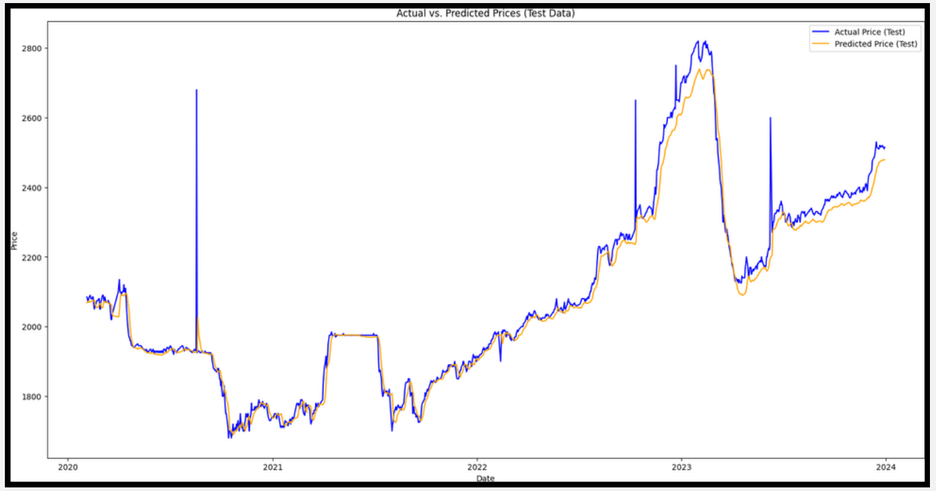
GRU


Actual vs. Predicted Prices (Training Data)
Actual Price (Training)
Predicted Price (Training)
Price
Date


Actual vs. Predicted Prices (Test Data)
Actual Price (Test)
Predicted Price (Test)
Price
Date

BI GRU


Actual vs. Predicted Prices (Training Data)
Actual Price (Training)
Predicted Price (Training)
Price
Date


Actual vs. Predicted Prices (Test Data)
Actual Price (Test)
Predicted Price (Test)
Price
Date

RESULTS

After testing the predicted data through all the parameters Mean Absolute Error, Mean Square Error, Root Mean Square Error, and R2 Score we have received values which have been compiled in the table and the graph

Model	MAE (Train)	MAE (Test)	MSE (Train)	MSE (Test)	RMSE (Train)	RMSE (Test)	R2 Score (Train)	R2 Score (Test)
RNN	12.2	20	1849.12	1557.09	43	39.46	0.9853	0.9791
LSTM	10.83	23.67	1722.02	1891.45	41.5	43.49	0.9863	0.9746
GRU	14.37	32.05	1726.49	2137.62	41.55	46.23	0.9862	0.9713
Bi RNN	10.41	29.67	1620.93	2787.53	40.26	52.8	0.9871	0.9625
BiLSTM	10.56	20.58	1721.9	1769.51	41.5	42.07	0.9863	0.9762
BiGRU	9.94	22.67	1574.19	1718.84	39.68	41.46	0.9874	0.9769

CONCLUSION & FUTURE

CONCLUSION

The project demonstrates the effectiveness of RNN-based architectures in dynamic crop price prediction. The implemented models exhibit promising performance metrics, indicating their potential utility in agricultural economics for decision support.

FUTURE SCOPE

We plan to use transformers, Sequence to Sequence and CNN in the future explorations

THANK YOU!!

SOHAM DAS	21051942
SHIVAM MISHRA	21051932
SHREYAS PANDE	21051936
GARVITA MISHRA	2105459