SMART INDIA HACKATHON 2024

TITLE PAGE

- Problem Statement ID – **1647**
- Problem Statement Title- Development of **AI-ML based models for predicting prices** of **agri-horticultural commodities** such as pulses and vegetable (onion, potato, onion).
- Theme- Agriculture, FoodTech & Rural Development
- PS Category- Software
- Team ID-
- Team Name (Registered on portal)- **Xebec's Crew**

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Quant Based Deep Learning Model

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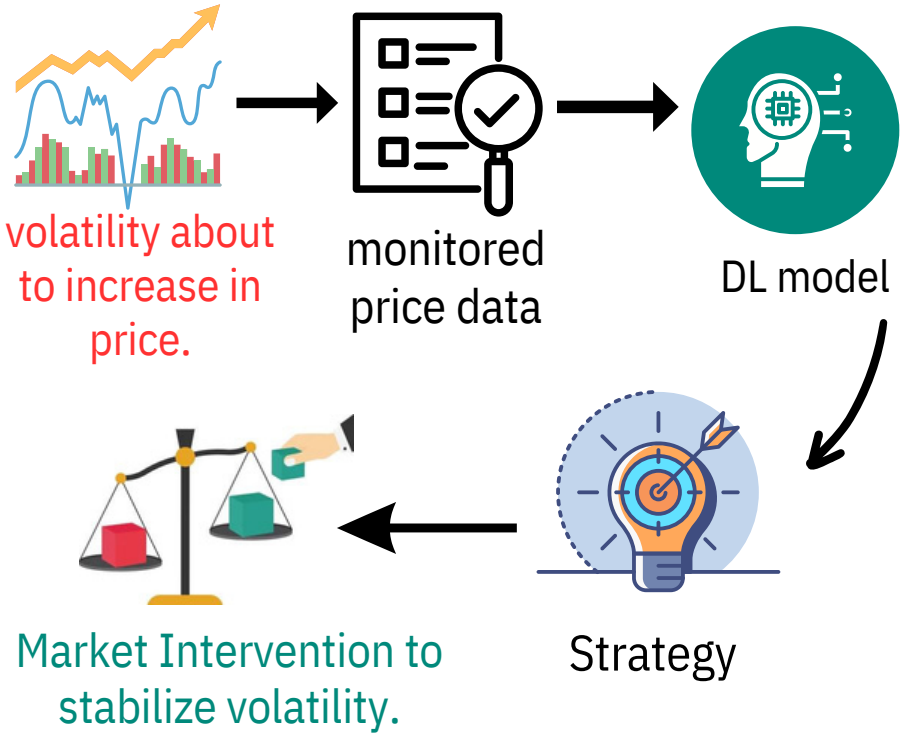
❖ Implementation of a Time-series based Deep Learning Model (LSTM+CNN Workflow) incorporated with quantitative financial analysis for strategic market interventions to stabilize the volatility in prices.

- The **DL spec TS model** captures the trend, seasonality and noise far better than ARIMA and SARIMAX, which gives the government a better control over the distribution of buffer stock.
- The **Bollinger Band** curve addresses the financial part of the problem i.e. where and when to send buffer stock and store stocks and pulses

Innovation and uniqueness of the solution:

- Incorporation of **LSTM model**, which helps us to predict over long term data, **unlike ARIMA model**.
- Improvising a **CNN workflow** ensures the solidity of model as it take in account the uncertainty, short-term fluctuations, and random noises.
- **Deploying the whole model into a website** for convenience and easy access.



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TECHNICAL APPROACH

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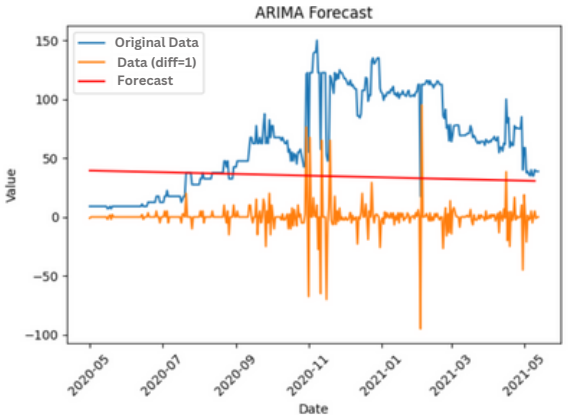
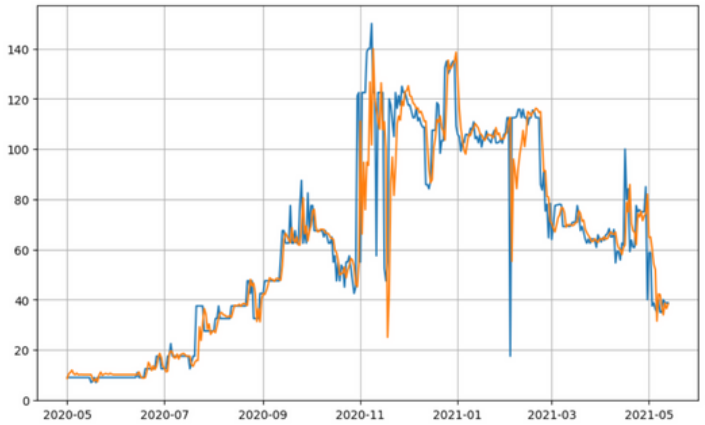
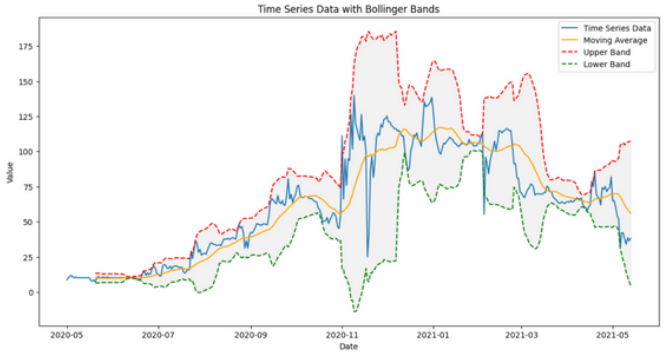


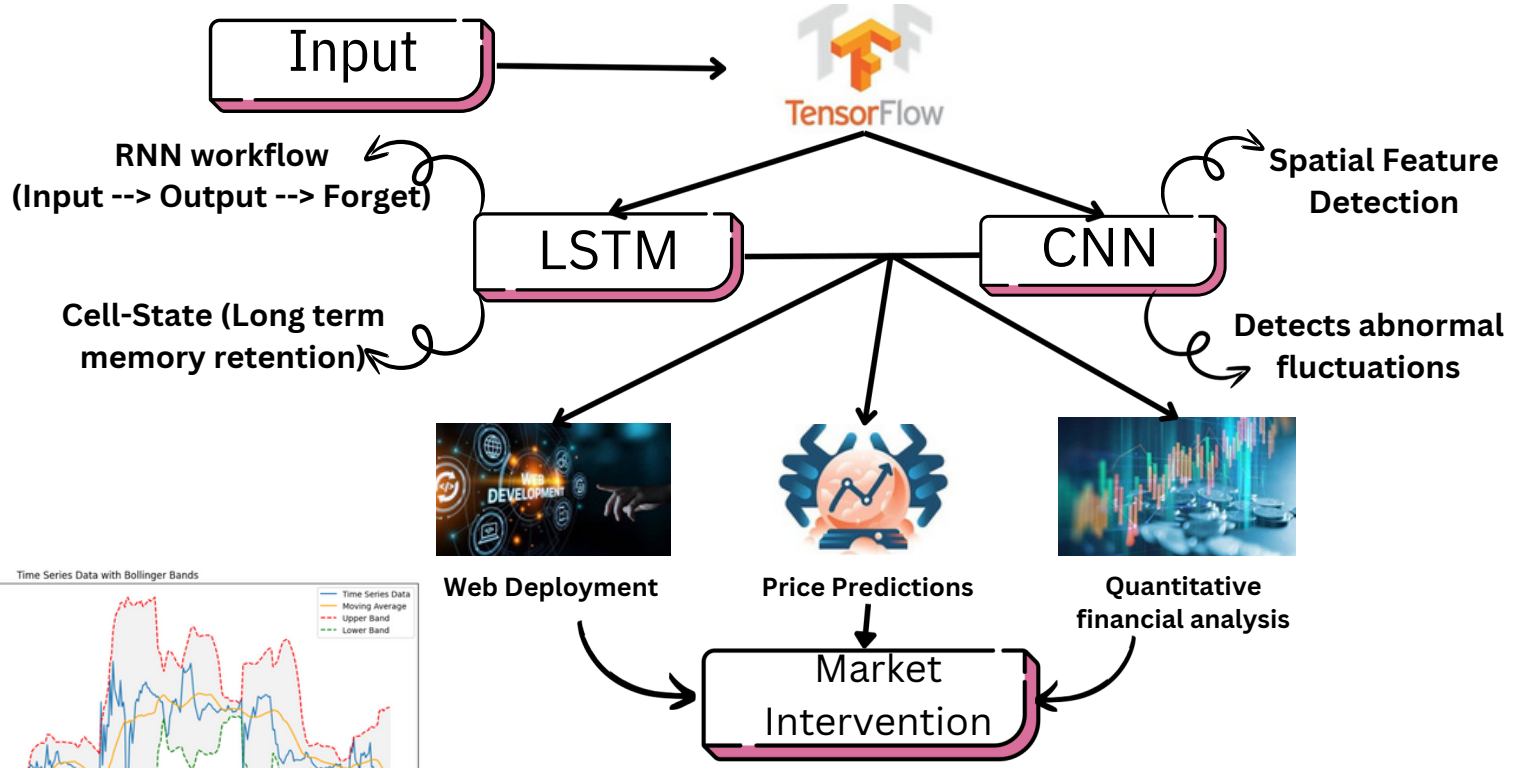
ARIMA Forecast



LSTM+CNN Model Forecast (screenshot taken from prototype model)



Bollinger Band Curve (specifying dates of interventions.)



Languages and Libraries Used:

HTML CSS JS django python NumPy pandas TensorFlow

prototype model: https://github.com/Falsegen1288/SIH_TS

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FEASIBILITY AND VIABILITY

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High feasibility as LSTM models have been proven **successful in finance, stock market prediction, and weather forecasting**—domains with similarities to agriculture. Major steps for completion are :-

- **Previously stored data**.(Crop Prices, weather forecast data, financial key metric data, stock buffer data along with location.)
- **Real-time data monitoring.**
- **Model implementation and testing.**
- **Market intervention.**

Potential challenges and risks: The biggest challenge is **real time data monitoring** and incorporating the data in model to make accurate predictions.

Another challenge can be to predict dates for interventions from the predicted price data.

Strategies for overcoming these challenges: Building an automated **AI model to append the real time data** in the input data set of our model to improve the predictions.

Solution of dates is covered in our model with dates that **overshoot the upper bollinger band** reported as dates for interventions.

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IMPACT AND BENEFITS

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IMPACT: Using the designed model for **successful market interventions** will certainly **stabilize the market price** in regions with a depreciation in crop price due to decrease of the crop in that region, ultimately leading to **availability of the crop at affordable price**.

Economic Benefit:

- **Price stability.**
- **Increased farmer income by securing fair prices.**
- **Cost efficiency.**
- **Improved market predictability for stakeholders.**

Social Benefit:

- **Farmer livelihood security.**
- **Enhanced food security.**
- **Reduced poverty.**
- **Less social unrest caused by food price spikes.**

Environmental Benefit:

- **Sustainable farming practices due to better planning and forecasting.**
- **Reduced food waste by balancing supply and demand.**

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RESEARCH AND REFERENCES

(Details / Links of the reference and research work)

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1.Time series analysis article

2.Article on Deep Learning based LSTM (Long - short term memory) model

3.Article on how to combine a LSTM & CNN framework

4.Research paper on Bollinger Band Curve