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Commodity Price Visualization and Analysis Using Web Technologies

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All files submitted by the author for peer review are listed below. Files that could not be converted to PDF are indicated; reviewers are able to access them online.

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Commodity Price Visualization and Analysis Using Web Technologies

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Abstract

Commodity market analysis plays a crucial role in understanding price trends, supply-demand dynamics, and market efficiency. This paper presents a data-driven approach for analyzing and visualizing daily price variations across multiple Indian markets. By leveraging Python-based libraries such as Pandas, Matplotlib, and Seaborn, this project provides real-time insights through an interactive dashboard. Additionally, machine learning models such as ARIMA and LSTM are implemented to forecast future prices, aiding stakeholders in better decision-making. The proposed methodology overcomes limitations of existing static models by incorporating real-time data integration and inter-market comparisons. The results demonstrate the effectiveness of this approach in improving market transparency and supporting strategic planning.

Keywords: Commodity Price Analysis, Data Visualization, Machine Learning, ARIMA, LSTM, Market Trends

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1. Introduction

Commodity prices fluctuate due to various factors, including supply-demand dynamics, government policies, and global economic conditions. Farmers, traders, and policymakers require real-time insights to make informed decisions. Existing studies focus on historical data analysis but lack real-time adaptability. This study aims to bridge the gap by integrating dynamic visualizations and predictive analytics to improve price forecasting and decision-making.

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2. Literature Review

Several studies have explored commodity price forecasting using statistical and machine learning models:

- **Singh et al. (2020):** ARIMA models for wheat price prediction, highlighting seasonality effects.
- **Sharma & Gupta (2021):** Regression models analyzing monsoon impact on rice pricing.
- **Patel et al. (2022):** LSTM neural networks for short-term vegetable price forecasting.

While these studies provide valuable insights, they lack real-time data adaptability and cross-market comparisons. Our approach enhances these methodologies by integrating interactive dashboards and statistical analysis.

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3. Proposed Methodology

The project involves the following key steps:

3.1 Data Collection & Preprocessing

- Data sourced from government repositories and commodity market databases.
- Cleaning involves handling missing values, removing anomalies, and formatting data.

3.2 Exploratory Data Analysis (EDA)

- Identification of trends and seasonal patterns using statistical methods.
- Visualization tools: **Matplotlib, Seaborn, and Pandas**.

3.3 Trend Analysis & Forecasting

- Implementation of **ARIMA** for time-series analysis.
- Application of **LSTM neural networks** for accurate short-term price prediction.

3.4 Interactive Dashboard

- Built using **Streamlit** for real-time monitoring.
- Features include market-wise filtering, trend comparisons, and forecasting tools.

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4. Results & Discussion

The implemented system provides:

- **Real-time visualization** of commodity price trends.
- **Market-wise comparison** highlighting price variations across regions.
- **Predictive analytics** improving forecasting accuracy.
- **Stakeholder decision support** through interactive tools.

Initial results indicate that integrating visual analytics with predictive modeling significantly enhances price trend understanding and decision-making capabilities.

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5. Conclusion & Future Work

This study demonstrates the effectiveness of integrating data visualization and machine learning for commodity price analysis. The proposed methodology enables better forecasting and market transparency. Future work includes:

- Expanding the dataset for broader regional analysis.

- Enhancing model accuracy with deep learning techniques.
- Implementing a mobile application for wider accessibility.

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6. References

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