"Strategic Analysis of INDIAN Agriculture: Leveraging Insights for Informed Decision-Making"

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ABSTRACT

In a landscape where precision is paramount, our approach revolves around utilizing valuable insights from diverse sources. These insights act as our compass, guiding us through the intricate web of agricultural dynamics. By meticulously analyzing these insights, we unearth opportunities to optimize our strategies, enhance productivity, and overcome challenges that the agricultural sector faces.

In this project, we aim to predict the possible increase in agricultural land by incorporating cultivable wastelands, fallow lands and more into agricultural land. Thereby, we can estimate the fertilizer requirements, irrigation necessities, and other resources needed. We can predict the additional crop yield which is a potential solution for increasing agricultural supply as demand rises due to the population.

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LITERATURE SURVEY

Reference [1] likely delves into the use of classification techniques for crop yield forecasting. Classification involves categorizing data points into predefined classes. This study probably examines how different crops can be classified based on historical data, environmental factors, and agricultural practices. The findings could contribute to developing accurate crop yield forecasting models, aiding farmers in making well-informed decisions regarding crop selection and resource allocation. Exploring regression analysis [2], to predict crop yields by modeling relationships between variables. The research likely investigates how factors such as climate variables, soil characteristics, and crop types impact yield outcomes. The results could contribute to informed decision-making by providing a quantitative framework for understanding yield dynamics. Similarly [3], introduces machine learning techniques to the field of crop yield prediction. Focusing on wheat yields, the research likely explores the estimation of neural network parameters. This approach harnesses the power of artificial intelligence to model complex relationships and predict wheat yields accurately. Reference [4], gives us a critical review that likely synthesizes existing literature on agriculture data analytics for crop yield estimation. By examining trends, methodologies, and gaps in the field, the paper provides an overarching perspective. This contributes to a more holistic understanding of the challenges and opportunities in harnessing data-driven insights for agricultural advancement. Whereas [5], examines how data analytics informs decisions in crop management, especially regarding weather-related factors. The study likely explores data-driven approaches for tasks like planting, irrigation, and pest control. This research contributes to the field of data-driven crop management strategies, aiming to enhance resource allocation and crop yields. Just like this study for Indian agricultural lands [6] has similarly focused on employing data mining techniques to forecast the yearly yield of key crops and offer crop recommendations tailored to specific districts in Bangladesh. By leveraging data mining methods, the research aims to enhance agricultural practices by predicting crop yields and suggesting suitable crop choices based on regional variations. Reference [7] highlights the diverse ways machine learning is employed to enhance agricultural practices. The review likely covers topics such as crop management, yield prediction, and resource optimization, showcasing the transformative potential of machine learning in revolutionizing the field of agriculture. Reference [8] addresses the multifaceted dynamics of agriculture in the context of globalization. The book likely explores the complex challenges and potential opportunities that arise in the changing landscape of agriculture and rural development. It's expected to offer insights into key topics such as sustainable practices, economic implications, and policy considerations in the context of a globalized world. Reference [9] investigates the spatio-temporal changes in land use and land cover (LULC) and the expansion of built-up areas in the suburbs of the Delhi National Capital Region (NCR). Utilizing Landsat datasets, the research likely analyzes how urbanization and development impact the landscape over time. The study contributes to an understanding of urban growth patterns and their implications for metropolitan areas, particularly focusing on Delhi NCR. Finally [10], presents a survey on the integration of big data analytics to extract significant insights for value creation. The study likely explores the connection between big data analytics and generating valuable insights. By delving into this integration, the research aims to provide a comprehensive overview of the potential benefits and challenges associated with harnessing big data for generating meaningful outcomes.

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DATA ACQUISITION

The datasets referred are:

1. Tata Cornell Institute ICRISAT dynamic dataset: http://data.icrisat.org/dld/src/crops.html
2. Crop Production in India (Kaggle) : https://www.kaggle.com/datasets/sanamps/crop-production-in-india
3. Crop Production Statistics for Selected States, Crops and Range of Year, Government dataset: https://aps.dac.gov.in/APY/Public_Report1.aspx
4. Crop fertilizer statistics of India: https://www.faidelhi.org/statistics/statistical-database
5. Irrigation, land holdings, Yield data for agriculture: https://www.indiastat.com/data/agriculture

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DATA EXPLORATION

1. **Data Cleaning**: Given that the data has been sourced directly from raw government databases, it is abundantly rich in information. However, within this wealth of data, there exist attributes that not valuable for the specific scope of our study.
2. **Feature Selection**: After the above process we will still need to filter out the very closely correlated attributes to our target variable so that the other attributes do not hamper the learning of the Machine Learning models in the later stages.
3. **Dimensionality Reduction**: This step may require combining and reducing the number of variables into newly generated attributes that secure the importance of the actual variables that were formerly present.
4. **Geospatial Analysis**: To analyze data based on geographic locations of the land area of agriculture.
5. **Data Visualization**: Very helpful not only to visualize the final results of the study but also to pick out uncertainties in the dataset and comparative analysis.
6. **Time-Series Analysis**: To analyze the usability of land over the years of irrigation and fallowing.

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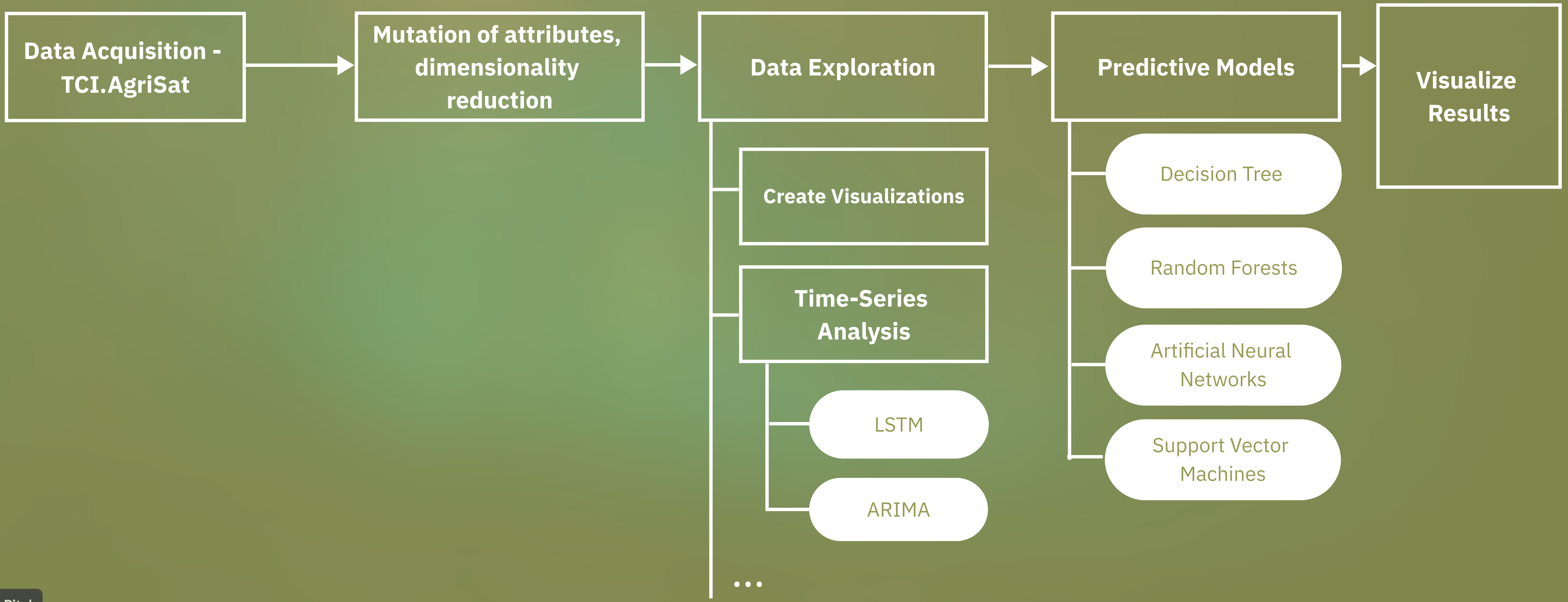
WORK FLOW DIAGRAM



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MODULES

Data Cleaning

Land Use Data is cleaned and brought to uniform values

Dimensionality Reduction

New columns are made and some are clubbed as required

Time-Series Analysis

'Fallow land' can be estimated for its usability in next 'n' years

Output factor(s)

Decision of the output factors of multiple models.

Data Visualization

Map visualize crop yields, land availability, etc.

Data Prediction Models

Choose models best for the data based on output factors needed. E.g. LSTM, Crop Yield - regression, ARIMA - time series

Analyse model performance

Analyse metrics, check for metric traps, use optimization techniques to enhance accurate prediction

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CONCLUSION

In conclusion, the strategic analysis we embark upon holds the power to revolutionize Indian agriculture. By leveraging insights, we elevate our decision-making processes, transforming challenges into stepping stones toward progress. With determination and strategic acumen, we are paving the way for a more sustainable, efficient, and prosperous agricultural sector.
This strategic analysis marks the threshold of an agricultural renaissance, where the synergy of data-driven insights and forward-thinking strategies will pave the way for resilience, efficiency, and a flourishing agrarian economy.

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