

Brick Nova

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Abstract: *Brick Nova is an intelligent web-based application designed to simplify and automate construction material estimation and cost prediction using machine learning techniques. The system takes user inputs such as area, location, and building specifications to generate accurate and data-driven estimates of material requirements and overall costs. By analyzing historical data and patterns, it reduces the dependency on manual calculations and minimizes errors. The application provides a user-friendly interface that helps engineers, contractors, and individuals make informed decisions quickly. Overall, Brick Nova enhances efficiency, accuracy, and transparency in construction planning through automation and predictive analytics.*

Keywords: *Construction cost estimation, machine learning, material prediction, price prediction, data analysis, web application, predictive modeling, civil engineering technology, cost optimization, and automation in construction are the key concepts involved in the Brick Nova project*

I. INTRODUCTION

The construction industry requires accurate planning and cost estimation to ensure successful project execution; however, Brick Nova is an intelligent web-based application designed to simplify and automate construction material estimation and cost prediction using machine learning techniques. The system takes user inputs such as area, location, and building specifications to generate accurate and data-driven estimates of material requirements and overall costs. By analyzing historical data and patterns, it reduces the dependency on manual calculations and minimizes errors. The application provides a user-friendly interface that helps engineers, contractors, and individuals make informed decisions quickly. Overall, Brick Nova enhances efficiency, accuracy, and transparency in construction planning through automation and predictive analytics.

II. RELATED WORK

Several approaches have been developed for construction cost estimation and material prediction, ranging from traditional manual methods to advanced machine learning-based systems. Traditional techniques rely on basic calculations and historical data, which are often time-consuming and prone to errors. To improve accuracy, various models such as Linear Regression, Decision Trees, Random Forest, and Neural Networks have been applied for cost prediction. Recent advancements include the use of deep learning and data-driven approaches to analyze complex construction patterns and improve prediction efficiency. However, many existing systems focus mainly on accuracy and lack user-friendly interfaces, real-time insights, and integrated features, highlighting the need for a comprehensive and accessible solution like Brick Nova.

III. METHODOLOGY

[1] Data Collection and Preparation

The data used in this system is collected from multiple organizations to represent real-world complaint handling scenarios. The dataset includes complaint details such as complaint type, description, priority level, submission time, user information, and status updates. Each record represents an individual complaint registered within the platform. Key



parameters influencing complaint processing include complaint category, urgency level, department assigned, response time, and resolution status. These features are essential for tracking, managing, and analyzing complaints efficiently.

To ensure data quality, preprocessing steps such as removal of incomplete records, normalization of textual inputs, and encoding of categorical attributes (e.g., complaint type, priority, and department) were applied. The data is structured to support efficient storage, retrieval, and processing within the system. Additionally, simulated data is generated to represent different complaint scenarios such as high-volume submissions, delayed responses, and resolved cases. This helps in testing system performance and scalability under various conditions.

[2] Feature Engineering and Design Modelling

Feature engineering plays a crucial role in improving the accuracy of the Brick Nova system by transforming raw construction data into meaningful inputs for prediction. Important features such as total construction area, number of rooms, material quality, location factors, and estimated labor costs are extracted and refined. Categorical data like location and material type are encoded, while new derived features such as cost per square foot, material quantity estimates, and overall budget range are generated to enhance prediction performance. A structured prediction model is then designed using machine learning algorithms like Linear Regression or Random Forest, which analyze these features to estimate material requirements and construction costs. This approach ensures more accurate, efficient, and reliable predictions for users

[3] Prediction Processing and System Implementation

The Brick Nova system is implemented as a web-based application that processes user inputs and generates accurate predictions for construction materials and costs. Users provide details such as area, location, and building specifications through an interactive interface. The backend system processes this data using trained machine learning models to estimate material requirements and overall cost. The application follows a structured workflow where input data is validated, processed, and passed to the prediction model, and the results are displayed to the user in a clear and understandable format. Secure data handling and efficient backend logic ensure smooth performance, while the user-friendly interface enhances accessibility and usability for builders, contractors, and individuals.

[4] Classification and Optimization Strategy

In Brick Nova, prediction outputs are classified into categories such as material requirements, estimated cost ranges, and budget levels to simplify analysis and decision-making. The system identifies patterns based on input features like area, location, and material type to group results effectively. Optimization strategies are applied to improve accuracy and efficiency, including model tuning, feature selection, and cost minimization techniques. Additionally, the system provides suggestions such as selecting cost-effective materials and optimizing resource usage, helping users reduce overall construction expenses and make better planning decisions.

[5] Dashboard Visualization and System Monitoring

The Brick Nova system includes an interactive dashboard that provides a clear and comprehensive view of prediction results and construction insights. It displays key information such as estimated material quantities, total cost, and budget breakdown in an easy-to-understand format. Visual elements like charts and summaries help users quickly analyze data and compare different scenarios. The dashboard enhances user experience by presenting real-time results, improving decision-making, and ensuring better planning for construction projects.

IV. SYSTEM ARCHITECTURE

The Brick Nova system is designed using a multi-tier architecture that includes three main layers: the frontend (presentation layer), backend (application layer), and database (data layer). The frontend is developed as a responsive web interface where users can input construction details such as area, location, and specifications, and view the



predicted results in a clear format. The backend is responsible for handling business logic, validating user inputs, and processing data through trained machine learning models to generate accurate predictions of material requirements and costs. The database layer securely stores datasets, user inputs, and prediction results for efficient retrieval and analysis. Communication between the frontend and backend is carried out through APIs, ensuring smooth and reliable data exchange. This architecture supports scalability, flexibility, and efficient system performance, making Brick Nova suitable for real-world construction planning applications.

V. RESULTS AND DISCUSSION

The Brick Nova system was evaluated using sample and real-world construction data to analyze its performance in predicting material requirements and costs. The results show that the system provides accurate and reliable estimates based on user inputs such as area, location, and building specifications. The dashboard visualization presents key outputs like total cost, material quantities, and budget distribution in a clear and understandable manner. The system demonstrates efficient processing, reduced manual effort, and improved decision-making for users. Overall, Brick Nova enhances construction planning by providing fast, data-driven insights while maintaining accuracy and usability.

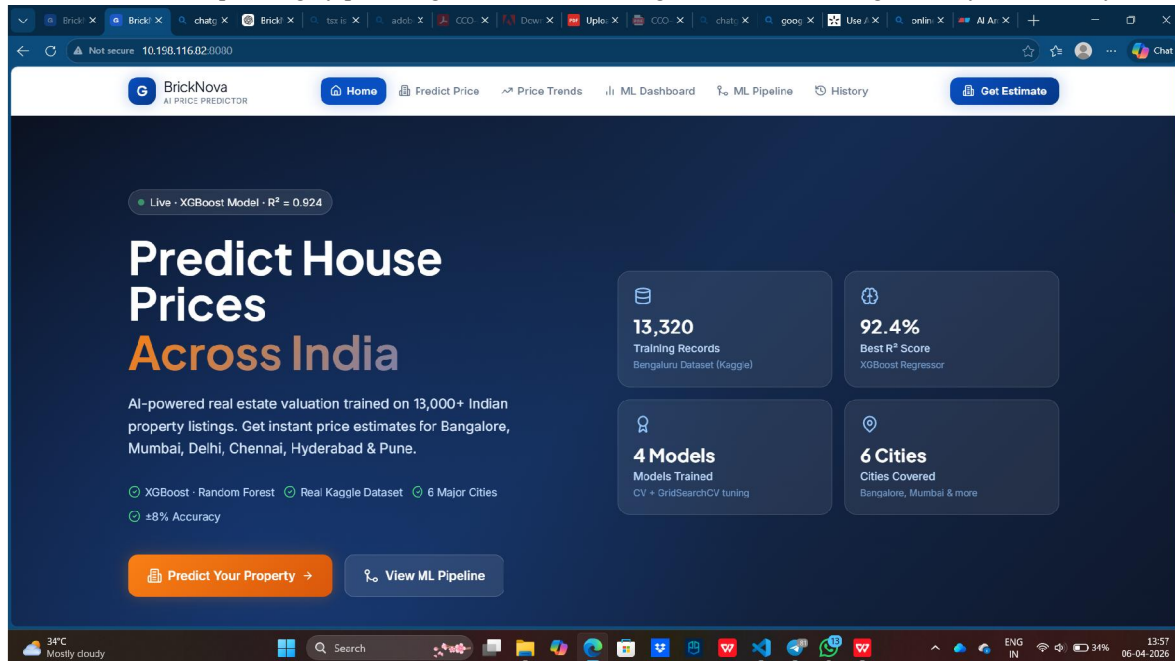


Figure 1 : Home Page



Figure 2 – Input Page

The input page of the Brick Nova system is designed to collect essential construction details from the user in a simple and structured manner. It includes fields such as total area, location, number of rooms, type of construction, and material preferences. The interface is user-friendly, allowing users to easily enter and modify data. Input validation is implemented to ensure accuracy and completeness of the information provided. Once the user submits the details, the data is sent to the backend for processing and prediction, forming the basis for accurate material and cost estimation.

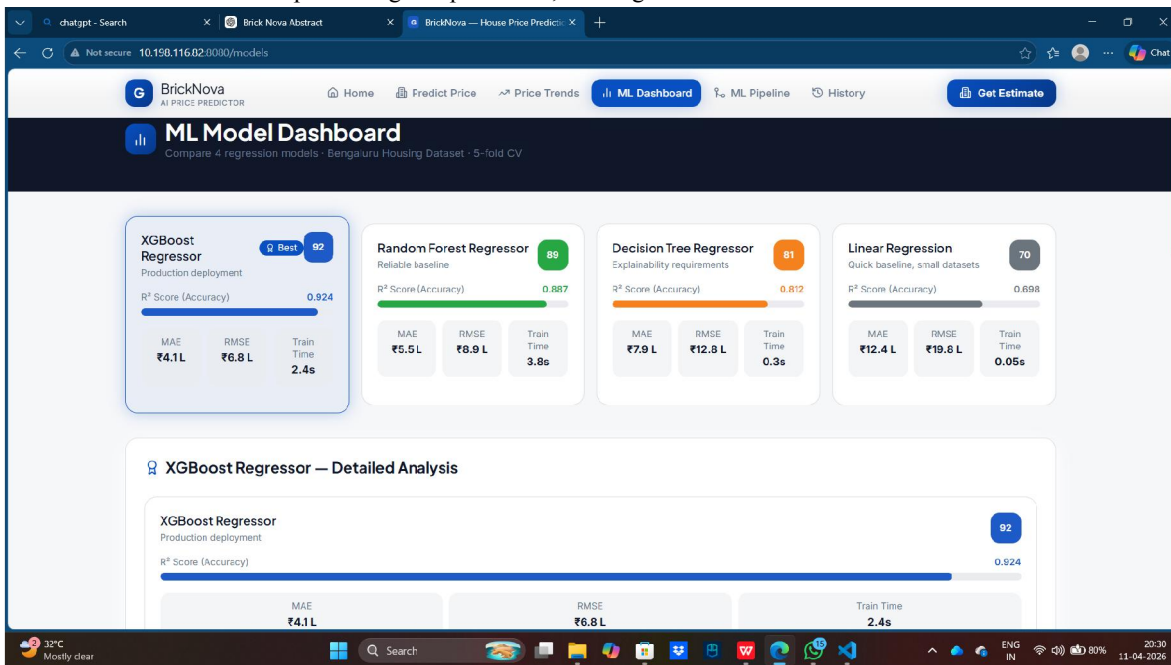


Figure 3 – Super Admin Dashboard

The dashboard in Brick Nova displays the prediction results in a clear and user-friendly format, including estimated material quantities, total cost, and budget breakdown. It uses simple visual elements to help users quickly understand and analyze the results, supporting better decision-making in construction planning.



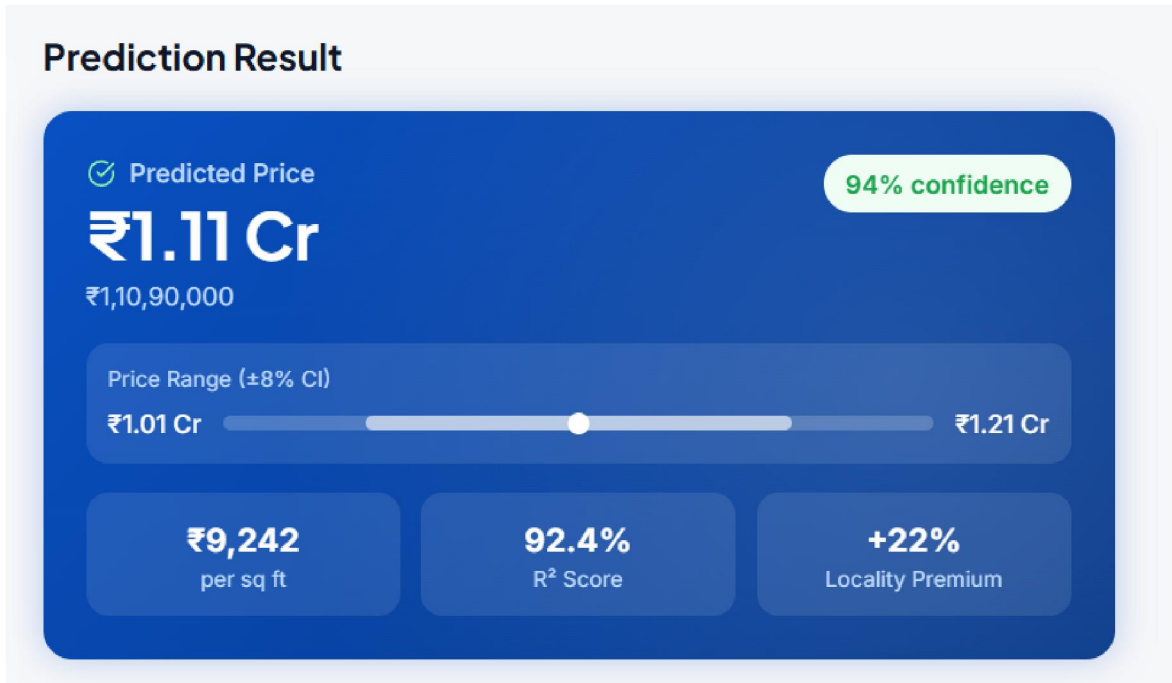


Figure 4 – Output Page

The output page of Brick Nova presents the final prediction results, including estimated material quantities and total construction cost based on user inputs. The results are displayed in a clear and organized format, making it easy for users to understand and use for planning and decision-making.

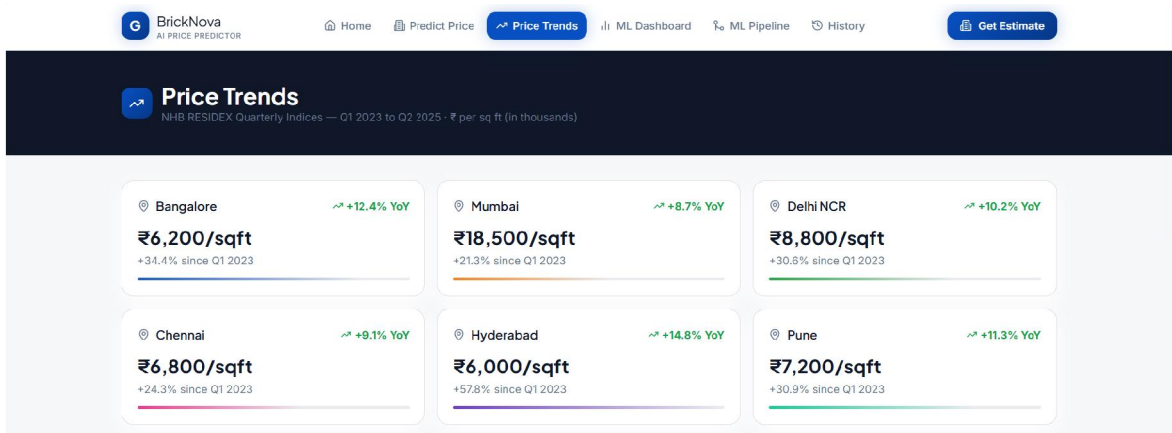


Figure 5 – Price Trends

The Brick Nova system analyzes price trends of construction materials to provide users with better cost insights and planning support. It considers variations in material prices based on factors such as location, demand, and market conditions. By studying historical data and current patterns, the system helps users understand how prices may fluctuate over time. This enables more accurate cost estimation and allows users to make informed decisions, such as selecting cost-effective materials or planning construction at the right time to minimize expenses.



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