

# Create Innovation for Electricity Price Prediction

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# Create Innovation for Electricity Price Prediction

Explore the challenges in electricity price prediction and discover the importance of innovation in this field. Let's dive into the technologies and methods that can enhance accuracy and the benefits they bring.

# DATASET DETAILS FOR ELECTRICITY PRICE PREDICTION:

<https://www.kaggle.com/datasets/chakradharmattapalli/electricity-price-prediction>

## Columns used:

- |                          |                        |
|--------------------------|------------------------|
| ➤ DateTime               | ➤ SystemLoadEA         |
| ➤ Holiday                | ➤ SMPEA                |
| ➤ HolidayFlag            | ➤ ORKTemperature       |
| ➤ DayOfWeek              | ➤ ORKWindspeed         |
| ➤ WeekOfYear             | ➤ CO2Intensity         |
| ➤ Day                    | ➤ ActualWindProduction |
| ➤ Month                  | ➤ SystemLoadEP2        |
| ➤ Year                   | ➤ SMPEP2               |
| ➤ PeriodOfDay            |                        |
| ➤ ForecastWindProduction |                        |



Libraries details:

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- Numpy
- Pandas
- Scikit-learn
- Tensorflow
- XGBoost
- pyTorch
- Matplotlib and seaborn
- prophet



# TRAIN AND TEST:

**Data Splitting:** Divide your dataset into a training set (used for model training) and a testing set (used for evaluation), often employing an 80-20 or 70-30 split.

**Model Training:** Train the XGBoost model on the training data. XGBoost excels in capturing intricate relationships within the data through iterative boosting.

**Model Testing:** Evaluate the model's performance on the testing data. Measure its predictive accuracy and its ability to generalize to unseen demand scenarios.



# MATRICES USED FOR THE ACCURACY CHECK:

- Accuracy: Overall correctness of predictions.
- Precision: Accuracy in labeling fraud.
- Recall: Ability to detect all fraud.
- F1-Score: Balance of precision and recall.
- AUC-ROC: Discrimination performance assessment.



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# Challenges in Electricity Price Prediction

## 1 Volatility and Uncertainty

Electricity prices fluctuate based on various factors such as demand, weather conditions, and market dynamics, making prediction challenging.

## 2 Data Complexity

Electricity price prediction requires analyzing vast amounts of data from multiple sources, including historical prices, energy production, and market trends.

## 3 Emerging Technologies

The fast-paced development of renewable energy sources and smart grid technologies adds complexity to price prediction models.





# Importance of Innovation in Electricity Price Prediction

1

## Cost Optimization

Accurate price prediction enables electricity market participants to optimize their operations, reducing costs and maximizing profits.

2

## Risk Management

Effective prediction allows energy consumers and producers to manage price-related risks, enhancing decision-making and strategic planning.

3

## Sustainability

By predicting future price trends, organizations can make informed investments in renewable energies, contributing to a sustainable energy future.



# Technologies and Methods for Improving Electricity Price Prediction

## Machine Learning

Machine learning algorithms can analyze vast data sets to identify patterns and make accurate predictions.

## Ensemble Models

By combining multiple models, ensemble techniques enhance prediction accuracy and robustness.

## Weather Integration

Integrating weather data into prediction models allows for more precise forecasting, considering the impact of temperature and other meteorological factors.

# Benefits of Accurate Electricity Price Prediction

## Optimal Resource Allocation

Precise forecasting enables efficient allocation of energy resources, preventing overproduction or shortages.

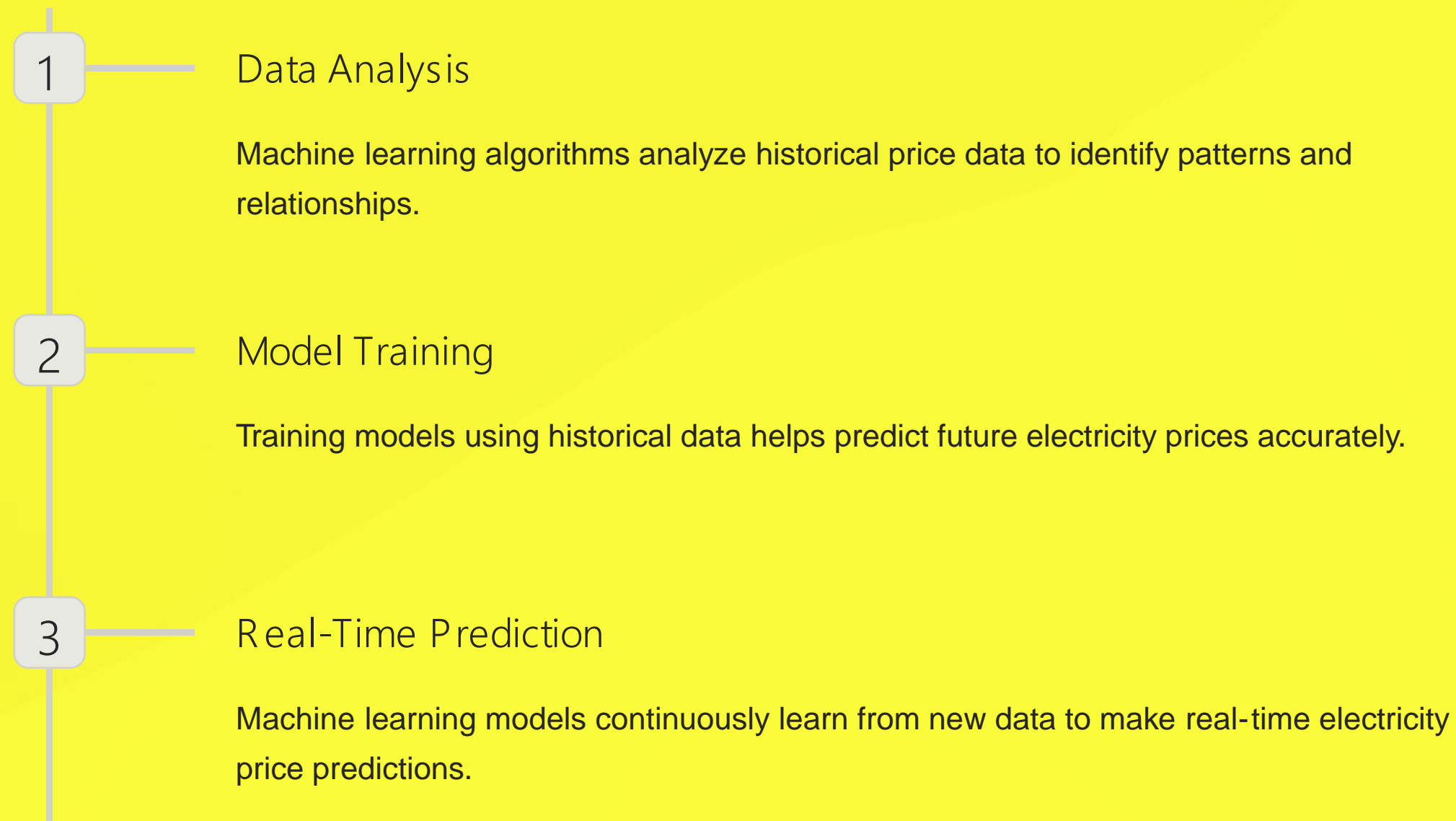
## Cost Reduction for Consumers

Accurate predictions empower consumers to adjust their electricity usage to minimize costs during peak demand periods.

## Increased Market Transparency

Predicting prices in advance provides market participants with valuable insights and fosters fair competition.

# Application of Machine Learning in Electricity Price Prediction





# Case Studies of Successful Innovation in Electricity Price Prediction



## Incorporating Renewable Energy Data

A case study demonstrating how including renewable energy production data improved electricity price prediction accuracy.



## Optimization Using Demand Response

Explore a successful case where demand response programs were integrated into price prediction models for efficient energy usage.



## Collaboration Between Experts

Learn how collaboration between energy experts, data scientists, and industry stakeholders led to significant improvements in electricity price prediction.

# Conclusion and Key Takeaways

- Electricity price prediction is challenging due to volatility, data complexity, and emerging technologies.
- Innovation is crucial in enhancing accuracy, optimizing costs, managing risks, and fostering sustainability.
- Technologies like machine learning, ensemble models, and weather integration improve electricity price prediction.
- Accurate prediction benefits resource allocation, cost reduction, and market transparency.
- Case studies illustrate successful innovation in incorporating renewable energy, demand response, and expert collaboration.

