



Measure Energy Consumption

Problem Definition and Design
Thinking

Problem Definition

- The problem at hand is to develop an automated system that measures energy consumption, performs data analysis, and generates visualizations to support data-driven decision-making. This solution aims to improve efficiency, accuracy, and the ability to manage energy consumption effectively across different sectors.

The background of the slide features a blurred line graph on a grid. A pen is visible, pointing towards the graph. The graph shows a line that fluctuates and then trends upwards. A dotted line is also visible on the grid.

Design Thinking

- Data Source: Identify an available dataset containing energy consumption measurements.
- Data Preprocessing: Clean, transform, and prepare the dataset for analysis.
- Feature Extraction: Extract relevant features and metrics from the energy consumption data.
- Model Development: Utilize statistical analysis to uncover trends, patterns, and anomalies in the data.
- Visualization: Develop visualizations (graphs, charts) to present the energy consumption trends and insights.
- Automation: Build a script that automates data collection, analysis, and visualization processes.



Data Source

- **Objective:** Clean, transform, and prepare the dataset for analysis.
- **Approach:**
 - Explore potential sources of energy consumption data, such as government agencies, utility companies, or open data repositories.
 - Evaluate the quality and relevance of available datasets.
 - Ensure data availability and accessibility for the project's scope.



Data Preprocessing

- **Objective:** Clean, transform, and prepare the dataset for analysis.
- **Approach:**
 - Handle missing values by imputation or removal.
 - Remove duplicates to maintain data integrity.
 - Standardize data types and formats.
 - Detect and address outliers or anomalies.
 - Organize data into a structured format for analysis.



Feature Extraction

- **Objective:** Extract relevant features and metrics from the energy consumption data.
- **Approach:**
 - Aggregate data based on appropriate time intervals (e.g., daily, weekly) to capture consumption trends.
 - Create lag features to capture historical dependencies.
 - Incorporate external factors like weather data, holidays, or economic indicators if relevant.
 - Identify and engineer features that represent energy efficiency or consumption patterns.

The background of the slide features a dark, abstract design. On the left side, there is a white line graph with several data points. One data point is highlighted with a yellow circle. In the center, there is a blue rectangular area containing the number '289.33' in white. The overall aesthetic is modern and technological, with a focus on data visualization.

Model Development:

- **Objective:** Utilize statistical analysis to uncover trends, patterns, and anomalies in the data.
- **Approach:**
 - Select appropriate statistical and machine learning models based on project goals.
 - For time series forecasting, consider models like ARIMA, LSTM, or Prophet.
 - For anomaly detection, explore techniques such as Isolation Forest or One-Class SVM.
 - Build regression models to identify factors influencing energy consumption.
 - Train and evaluate models using suitable metrics.
 - Consider continuous model updates for real-time insights.



Visualization

- **Objective:** Develop visualizations (graphs, charts) to present energy consumption trends and insights.
- **Approach:**
 - Create time series plots to visualize consumption patterns over time.
 - Use heatmaps to display consumption variations by time and other factors.
 - Employ bar charts, pie charts, or scatter plots to represent energy usage by category or explore relationships.
 - Choose visualization libraries like Matplotlib, Seaborn, or Plotly for creating interactive and informative visuals.
 - Ensure that visualizations are user-friendly and provide actionable insights.

An abstract digital cityscape composed of glowing blue cubes and rectangular blocks. The surfaces of these structures are covered in a dense pattern of binary code (0s and 1s). Several bright blue, green, and red light beams emanate from the structures, creating a sense of dynamic energy and data flow. The background is a gradient of dark blue to light blue, with a few floating binary digits and small colored circles (red, green, blue) in the upper left corner.

Automation

- **Objective:** Build a script that automates data collection, analysis, and visualization processes.
- **Approach:**
 - Set up scheduled data collection from online sources or APIs.
 - Implement automated data preprocessing and feature extraction.
 - Trigger model updates or retraining when new data becomes available.
 - Generate and save automated reports or dashboards with the latest insights.
 - Document the automation process for reproducibility and maintenance.