

INTERNET OF THINGS

ENVIRONMENTAL MONITORING

ENVIRONMENTAL MONITORING

Environmental monitoring can be defined as the systematic sampling of air, water, soil, and biota in order to observe and study the environment, as well as to derive knowledge from this process.

PROJECT DEFINITION

- ▶ Environmental monitoring refers to systematic sampling of air, water, soil, and biota in order to observe and study the environment, as well as to derive knowledge from this process.

REAL-TIME ENVIRONMENTAL MONITORING

- ▶ REMAS is a robust, real-time environmental data management system that measures, records, and analyzes data with alerting and on-site or web-based display.

AIDING PARK VISITORS IN ACTIVITY PLANNING

Parks and playgrounds can become the hearts of communities, meaning community planners should make these recreation areas high priorities.



PROMOTING OUTDOOR EXPERIENCE

The Benefits of Playing Outside

Playing outside promotes...



IOT IN PUBLIC PARK



ENVIRONMENTAL MONITORING METHODS

- ▶ Ground-based Sampling and Measurements
- ▶ Model-based Monitoring
- ▶ Satellite based Monitoring

ADVANTAGES OF ENVIRONMENTAL MONITORING

- ▶ Real-time monitoring capabilities
- ▶ cost-effectiveness
- ▶ increased accuracy
- ▶ scalability to help reduce
- ▶ prevent environmental damage

DISADVANTAGES OF ENVIRONMENTAL MONITORING

- ▶ The current technology is expensive
- ▶ provides only a snapshot of data
- ▶ requires expertise to use and takes time in lab analysis

APPLICATION OF ENVIRONMENTAL MONITORING

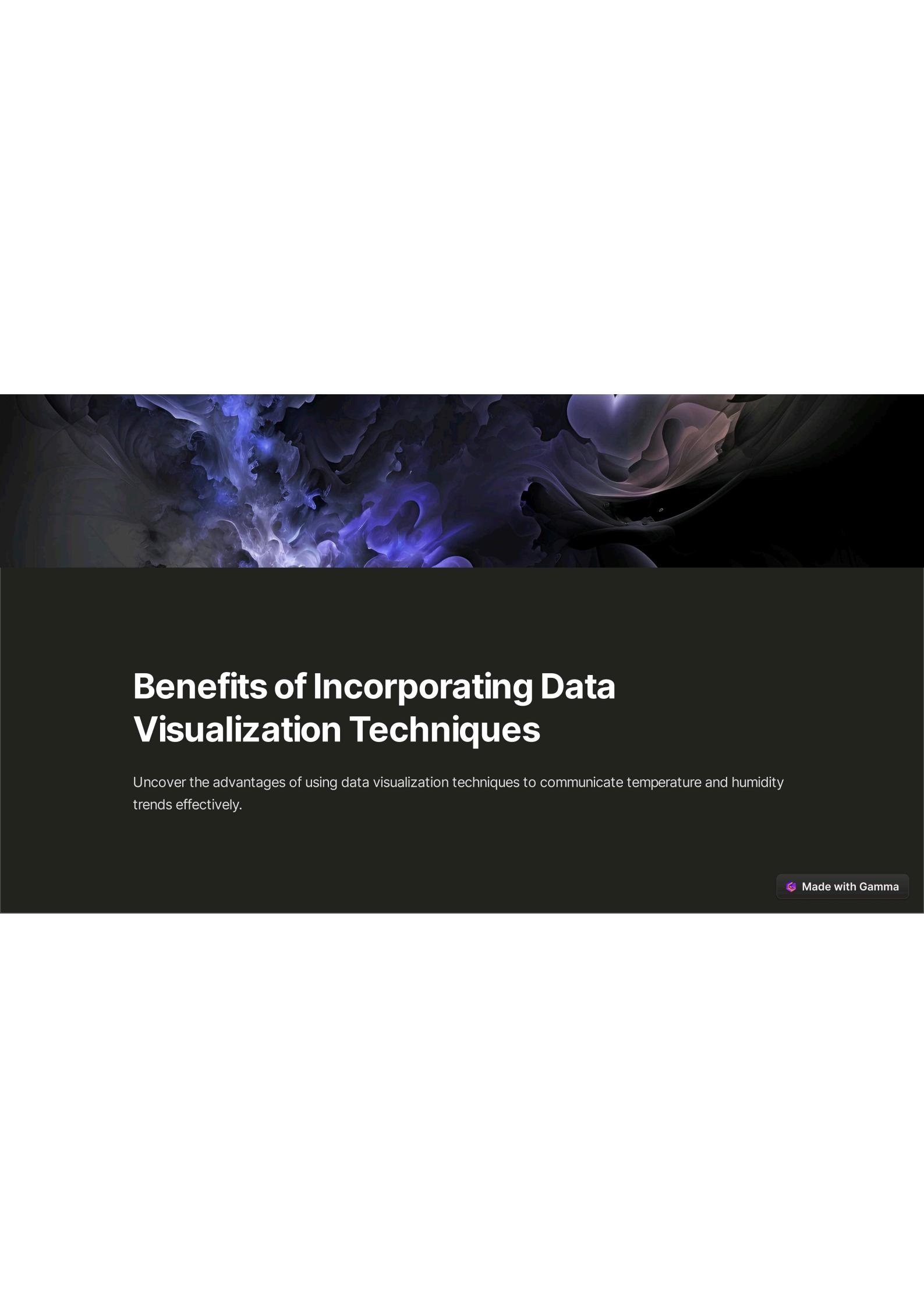
- ▶ Broad – environmental protection
- ▶ extreme weather monitoring
- ▶ water safety
- ▶ endangered species protection
- ▶ commercial farming
- ▶ and more

Importance of Data Visualization

Discover how data visualization can simplify complex information and help identify patterns and trends.



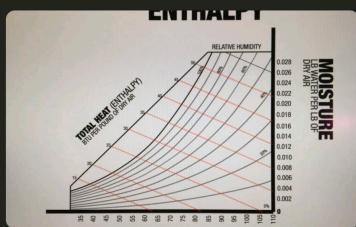
Made with Gamma



Benefits of Incorporating Data Visualization Techniques

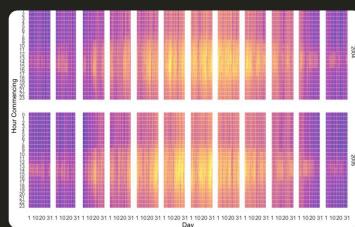
Uncover the advantages of using data visualization techniques to communicate temperature and humidity trends effectively.

Examples of Data Visualization Techniques for Temperature and Humidity Trends



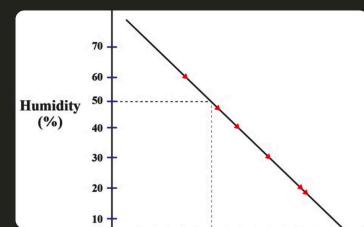
Line Charts

Visualize temperature and humidity trends using line charts to easily compare and understand data.



Heatmaps

Discover temperature and humidity patterns with vibrant heatmaps that bring the data to life.



Scatter Plots

Identify correlations between temperature and humidity through scatter plots that provide valuable insights.

How to Effectively Use Data Visualization in Presentations

Storytelling Approach

Engage your audience by framing temperature and humidity data within a compelling narrative.

Simplify Complex Data

Use data visualization to simplify complex data sets and make it accessible to a wider audience.

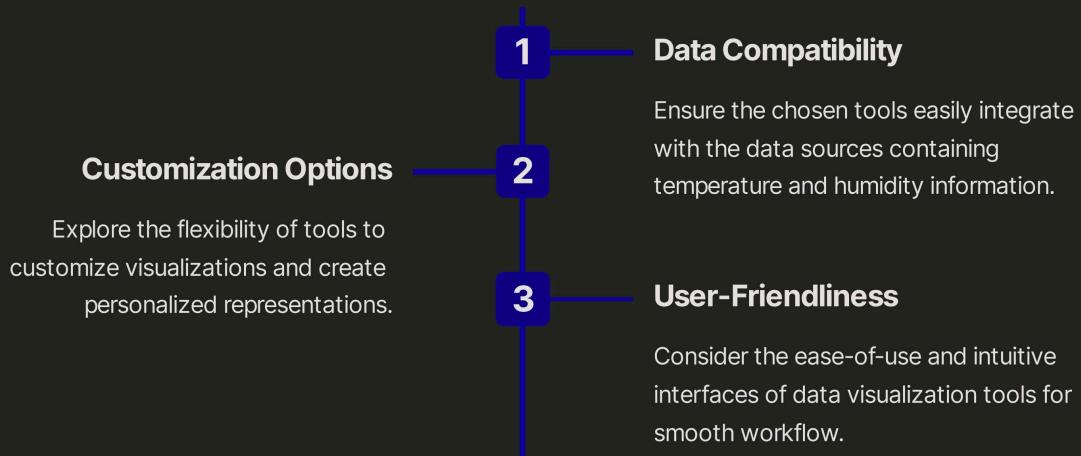
Choose the Right Visuals

Select the most appropriate data visualization technique to effectively communicate your message.

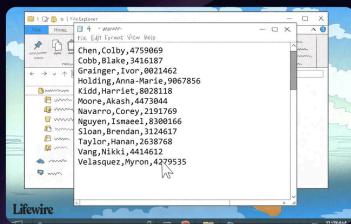
Focus on Key Insights

Prioritize key insights and highlight them visually to ensure your audience understands the main takeaways.

Considerations When Selecting Data Visualization Tools



Loading the Dataset



From a CSV File

Load data from a CSV file using Pandas, ensuring that it is formatted correctly.



From an API

Fetch data programmatically from an API, providing a direct connection to a data source.



From a Database

Retrieve data from a database, such as MySQL or PostgreSQL, using SQL queries.

Exploring the Dataset's Structure and Attributes

Overview

Get a quick overview of your dataset by checking the number of rows, columns, and data types.

Descriptive Statistics

Analyze statistical measures like mean, median, and standard deviation to gain insights into your data.

Unique Values

Identify unique values in categorical columns and examine their distributions.

Correlation

Investigate the correlations between different numerical attributes to uncover hidden patterns.

Handling Missing Values and Outliers

Outliers Identification

Explore outliers using statistical methods like Z-score, IQR, or visualization techniques to determine their impact on analysis.

1

Missing Values

Detect missing values and decide how to handle them - imputation, deletion, or consider methods like MICE.

2

Outliers Treatment

Decide how to handle outliers and consider techniques like Winsorization, removing or transforming them as appropriate for the analysis.

Transforming and Cleaning the Data



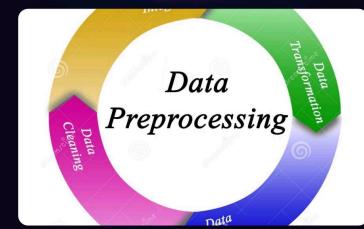
Data Cleaning

Remove unnecessary columns, correct inconsistent values, handle inconsistencies, and ensure data integrity.



Data Transformation

Transform attributes by scaling, encoding, or creating new features using techniques like feature engineering.



Data Preprocessing

Perform preprocessing tasks like one-hot encoding, categorizing, or normalizing data to prepare it for analysis.

Feature Scaling or Normalization (if applicable)

1 Standardization

Standardize data features to have zero mean and unit variance, which can be advantageous for certain machine learning algorithms.

2 Normalization

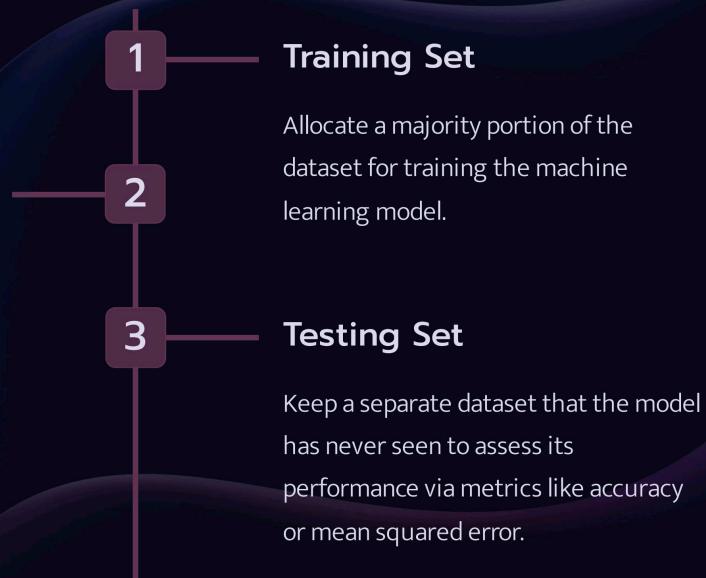
Normalize numerical data to a common scale, preserving the distribution and making it easier to interpret and compare.

3 Scaling Techniques

Explore other techniques like Min-Max scaling or Robust scaling suitable for specific scenarios.

Splitting the Dataset into Training and Testing Sets

Validation Set
Set aside a smaller portion of the data to fine-tune the model during hyperparameter optimization.



Importance of Environmental Monitoring

1 Safeguarding Ecosystems

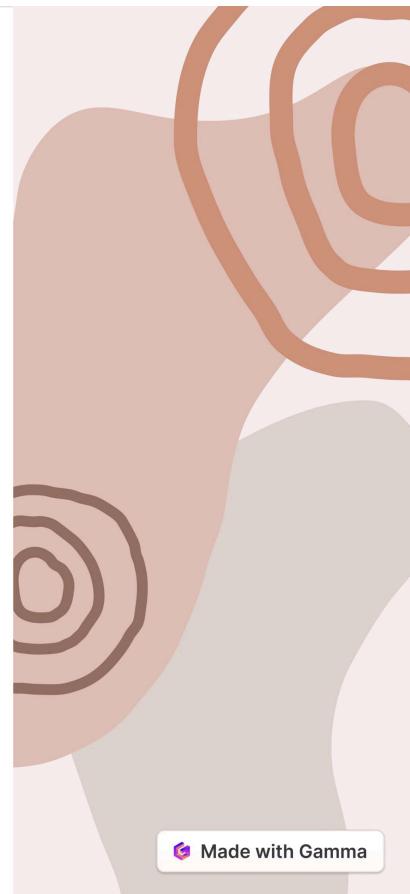
Learn why monitoring plays a vital role in protecting delicate ecosystems and preserving biodiversity.

2 Ensuring Human Health

Discover how monitoring helps assess and mitigate the impact of environmental factors on public health.

3 Mitigating Climate Change

Understand the role of monitoring in understanding climate patterns and enhancing climate change adaptation strategies.



Feature Engineering in Environmental Monitoring

Definition

Unveil the process of feature engineering and its significance in extracting relevant information from environmental data.

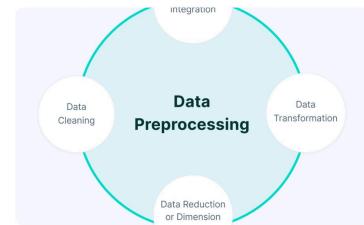
Techniques

Explore advanced techniques such as dimensionality reduction and feature selection for effective feature engineering.

Methods

Learn about specific algorithms and approaches used to transform raw data into meaningful features for analysis.

Model Training in Environmental Monitoring



The Training Process

Delve into the steps involved in training models for environmental monitoring, from data preparation to model optimization.

Types of Models

Discover a range of models used, from traditional statistical models to cutting-edge machine learning algorithms.

Data Preprocessing

Understand the critical role of data preprocessing in preparing training datasets and ensuring accurate model performance.



Model Evaluation in Environmental Monitoring

1

Importance of Evaluation

Learn how model evaluation plays a crucial role in assessing the reliability and performance of environmental monitoring models.

2

Performance Metrics

Explore various evaluation metrics used to measure model accuracy, precision, recall, F1 score, and more.

3

Improving Model Performance

Gain insights into techniques for enhancing model performance through fine-tuning, ensemble methods, and hybrid models.

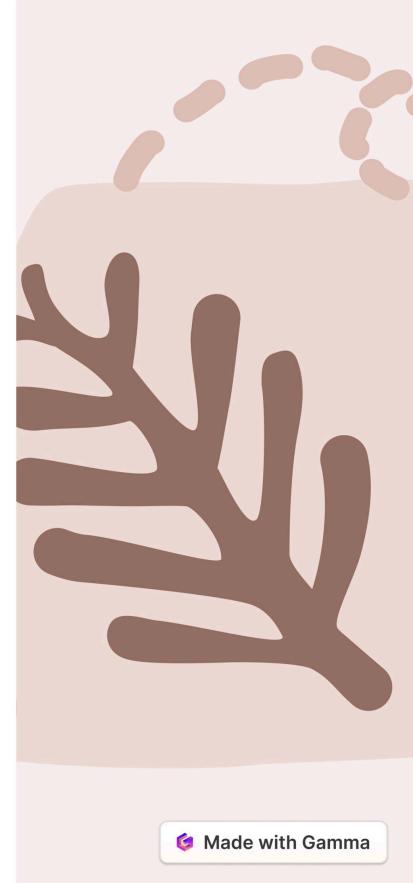
Conclusion: Summary and Future Directions

Summary

Recap the key points covered in this presentation, emphasizing the importance of environmental monitoring and its key components.

Challenges & Innovations

Look ahead to future directions, exploring challenges and emerging technologies driving advancements in environmental monitoring.



► Submitted by.....

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