



Using Machine Learning to Predict Weather Conditions

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Objective and Hypotheses

Objective:

- Explore how machine learning can predict weather conditions and evaluate its effectiveness and accuracy.

Hypotheses:

- 1. Using historical weather data, machine learning can accurately predict the frequency of extreme weather events.
 - 2. Supervised learning models are particularly effective at forecasting specific weather conditions.
 - 3. Warmer temperatures correlate positively with the occurrence of pleasant weather days.
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Data Source and Biases

Data Source:

- European Climate Assessment & Data Set (ECA&D) project.

Potential Biases:

- Collection Bias: Changes in instrumentation, measurement methods, or station location over time.
- Sampling Bias: Data collected from 18 specific stations out of 26,321 stations across Europe.

Data Accuracy:

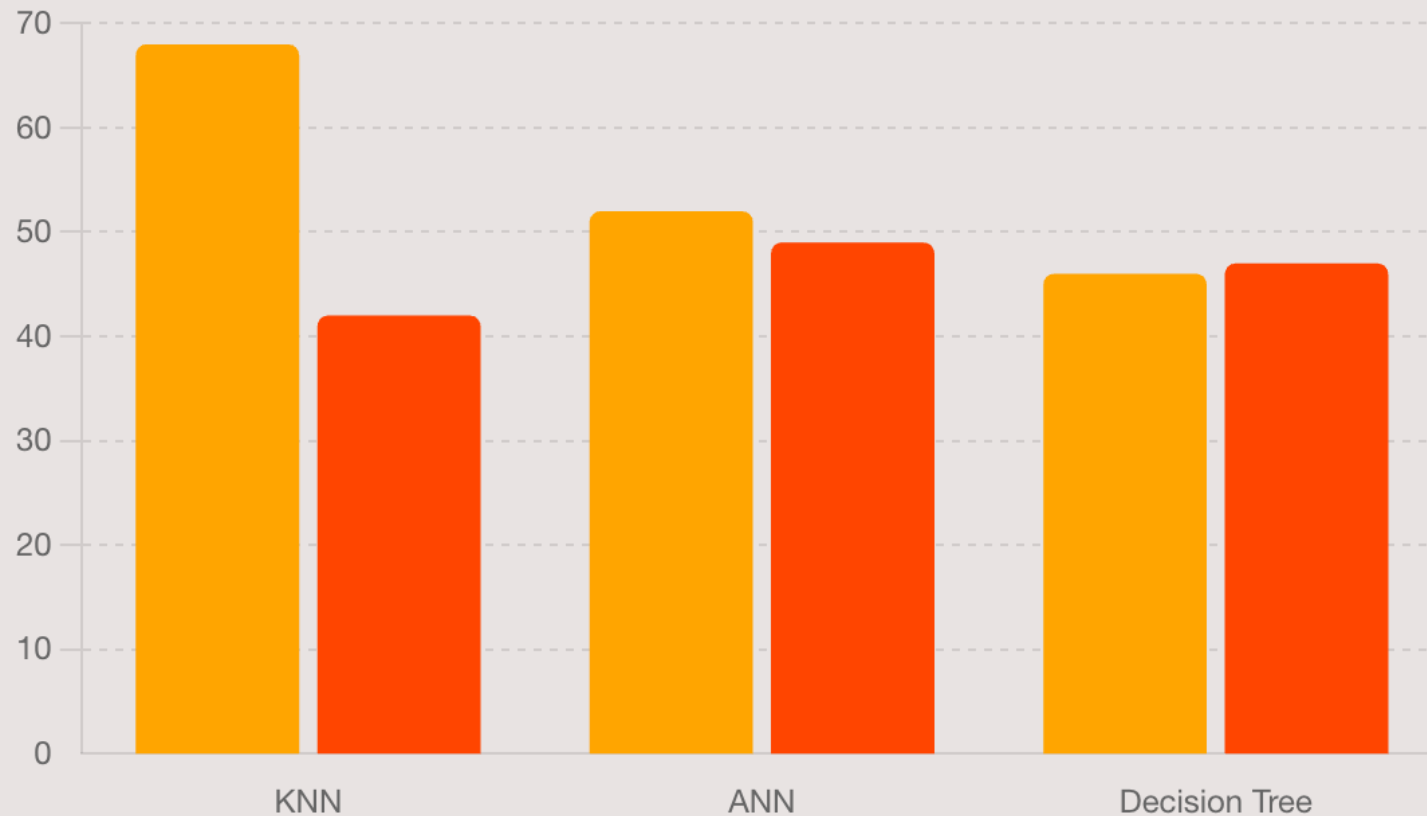
- The data is considered accurate due to daily collection and a wide range of measured variables (temperature, wind speed, snow, global radiation, etc.).
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Data Optimization

Optimization Methods Used:

- Gradient Descent: To find the best-fit line or curve by minimizing the error.
 - Decision Tree Pruning: To simplify the model and avoid overfitting.
 - Complex Matrix: To evaluate and improve model accuracy through testing and validation.
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Supervised Learning Algorithms



Algorithms Used:

- K-Nearest Neighbors (KNN):
 - Training Accuracy: 68%
 - Test Accuracy: 42%
- Artificial Neural Network (ANN):
 - Training Accuracy: 52%
 - Test Accuracy: 49%
- Decision Tree:
 - Training Accuracy: 46%
 - Test Accuracy: 47%

Summary and Next Steps

Summary of Hypotheses and Methods:

- The hypotheses were validated using KNN, ANN, and Decision Tree models.
- KNN was the most consistent, although both KNN and ANN showed overfitting issues, and Decision Tree was the most accurate overall.

Next Steps:

- Continue optimizing the Decision Tree model.
 - Explore ensemble methods combining supervised and unsupervised models.
 - Extend research to uncategorized patterns using unsupervised learning.
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THANK YOU!



Any questions?
[GitHub repository](#)



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