ClimateWins: Predicting Climate Change with Machine Learning

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Why This Project Matters

- - Weather is getting more extreme and harder to predict.
- - This affects people's safety and health.
- - ClimateWins uses machine learning to:
- • Spot strange weather in Europe
- • See if weird weather is happening more often
- • Predict future weather 20–50 years ahead
- • Find the safest places to live in Europe

Our Three Big Ideas

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1. Classify Unusual Weather – Group weather by how normal or weird it is

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2. Make Future Predictions – Guess future weather using smart computer models

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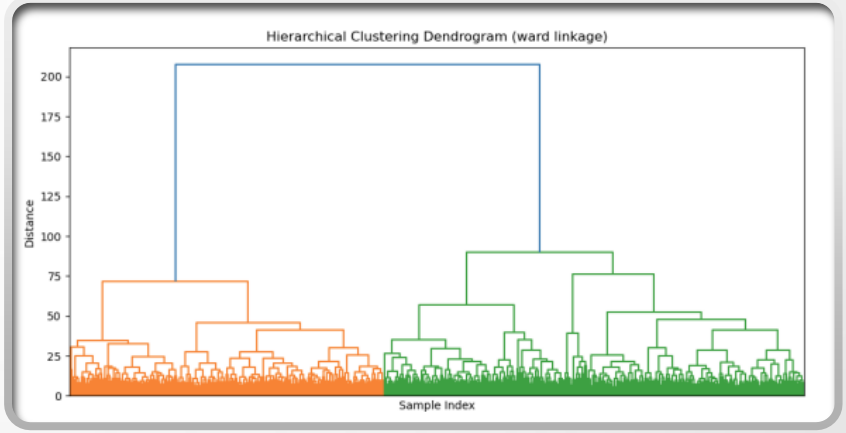
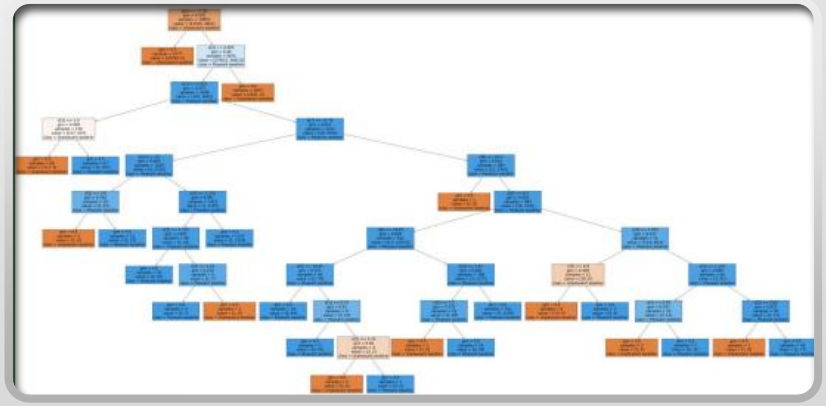
3. Find Safe Areas – Show which places in Europe are safer from extreme weather

Tools We Used

- Hierarchical Clustering:
- - Groups similar weather data together
- - Makes a tree of how different weather events are



- Random Forest:
- - A bunch of decision trees working together
- - Good at making strong predictions



More Tools We Used

- GAN (Generative Adversarial Network):
- - Makes fake weather data that looks real
- - Helps train other models better

- CNN (Convolutional Neural Network):
- - Great at looking at pictures like radar maps
- - Helps analyze weather in detail

Data We Needed

- Extreme Weather Data (storms, heat waves, cold)

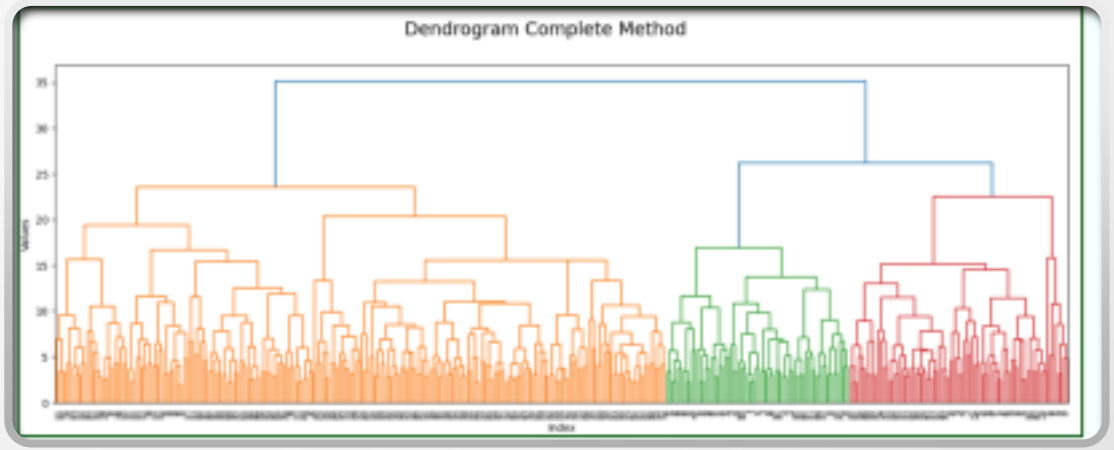
- Radar Images of weather

- Health Records (injuries and sickness from weather)

- Lists of Dangerous Weather Types

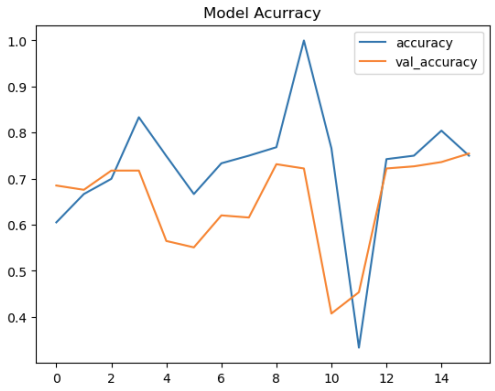
Experiment 1: Classify Weather

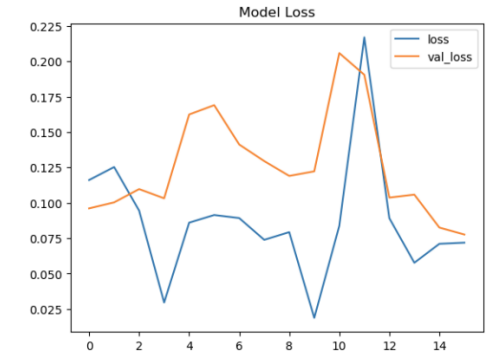
- Goal: See if weird weather is happening
- Tool: Hierarchical clustering
- What We Did:
- - Used weather data over different years and seasons
- - Found 2–3 weather groups
- Next Steps:
- - Use this with other models to get stronger results



Experiment 2: Predict Future Weather

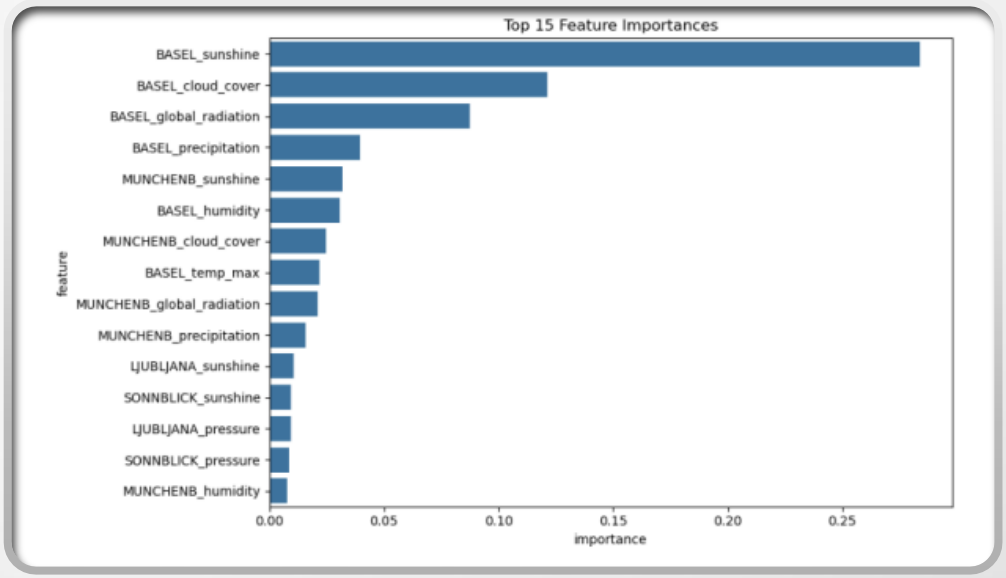
- Goal: Guess weather 25–50 years from now
- Tools: GAN + CNN
- What We Did:
- - Used GAN to make fake weather data
- - Used CNN to make predictions
- - Improved model accuracy from 10% to 61%
- Next Steps:
- - Keep testing across countries and years
- The GAN produced weather data with 98.4% accuracy and 1.1% loss, suggesting high potential for use with the CNN model





Experiment 3: Find Safe Places

- Goal: Show safest places to live in Europe
- Tool: Random Forest
- What We Did:
- - Ran models on weather and health data
- - Accuracy improved from 59% to 67%
- - Found important weather features for safety
- Next Steps:
- - Fine-tune the model
- - Compare with real health effects



What Worked Best

- Using GAN and CNN gave the biggest accuracy jump

- This combo can really help in future planning

- These models are already helping predict real-world extreme weather

What We Need Next

- Best Tools:
- - CNN, GAN, and optimization techniques

- Best Data:
- - Storm and radar data
- - Health and hazard info

- Next Steps:
- - Improve models
- - Gather more data
- - Keep testing and learning

Thank You!!

Github: https://github.com/jamestnanthikattu
Youtube link: https://youtu.be/ZvcqSssIcD8