Facilities and Climate Change: Embracing Sustainability for a Greener Future

Team - *Risers*

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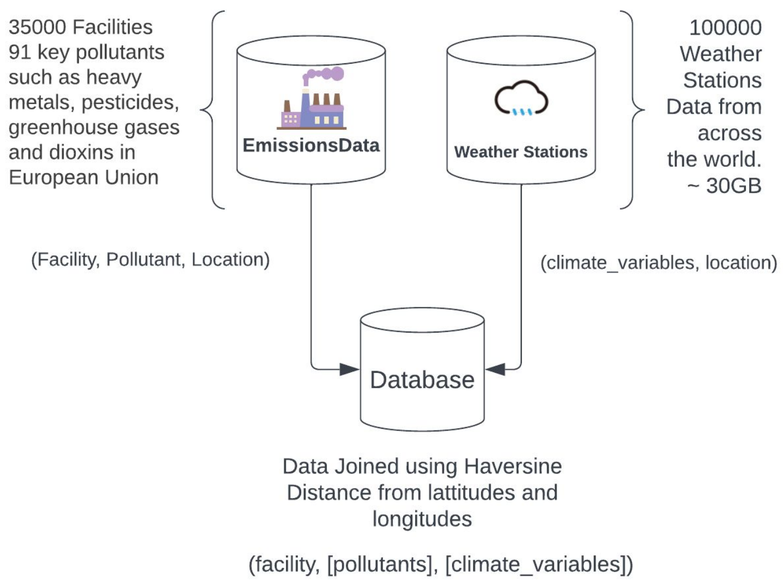
Introduction:

Prioritizing sustainable practices within buildings, industrial complexes, and infrastructure is crucial for addressing climate change and reducing their environmental footprint, in alignment with SDG Goal 13. Big data frameworks and analytics play a vital role in handling and analyzing the vast and complex data generated by these facilities, enabling us to derive meaningful insights, identify patterns and correlations, construct predictive models, and make informed decisions to mitigate their climate impact.

Background

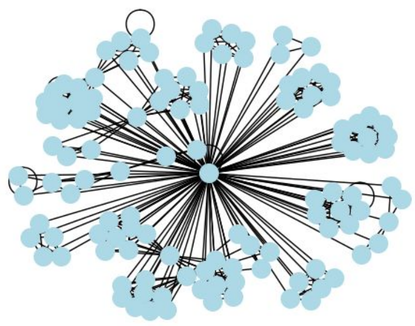
1. Industries contribute to greenhouse gas emissions, with a 43% increase in atmospheric carbon dioxide since pre-industrial times due to human activities (IPCC, 2018).
2. Pollutants from industries, including sulfur dioxide and nitrogen oxides, lead to poor air quality, affecting ecosystems and human health (WHO, 2016).
3. The burning of fossil fuels by industries contributes to global warming and climate change, causing rising sea levels, altered weather patterns, and increased frequency of extreme weather events (NASA, n.d.).

Data

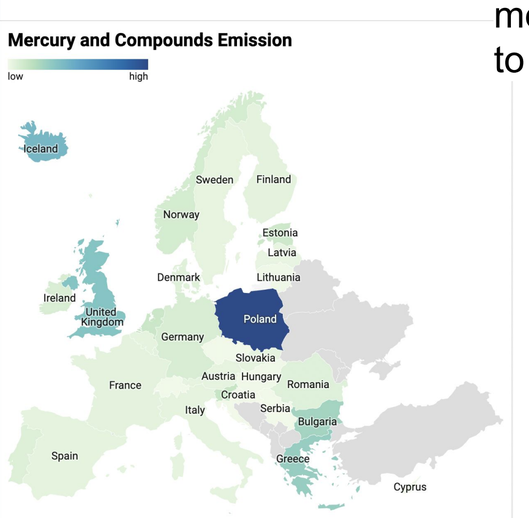


Data was collected from different sources. It is then processed to form into a desired structure using Pyspark and Pandas for various use cases.

Results



Similar Facilities grouped



Hypothesis Testing for mercury: In one group the release of mercury significantly increases the avg temperature change. So, we can suggest ways to reduce the mercury emission to that group. Poland has the highest emission of Mercury, they can bring up regulations to facilities of one group to regulate the emission.

Facility_Attributes	Change_in_avg_temp
1,1,1-trichloroethane	-0.0001774977869
1,1,2,2-tetrachloroethane	0.0008196850182
1,2,3,4,5,6-hexachlorocyclohexane	0.004585624077
1,2-dichloroethane (DCE)	0.0006970961398
Alachlor	0.002454151933
Aldrin	0.01202948893
Ammonia (NH3)	0.001161267474
Anthracene	0.000243055155
Arsenic and compounds (as As)	-0.0008557538117

Correlation matrix of all pollutants with all environmental variables

Predictive Modeling:
Trained using 128-sample batches, 40 nodes, and 15 epochs, successfully mapped 89 input attributes to 3 output attributes. Achieving an ~0.694 accuracy on the 15% test dataset, with a regression threshold of 0.5, our model effectively predicts climate variables such as changes in average temperature and precipitation for new facilities.

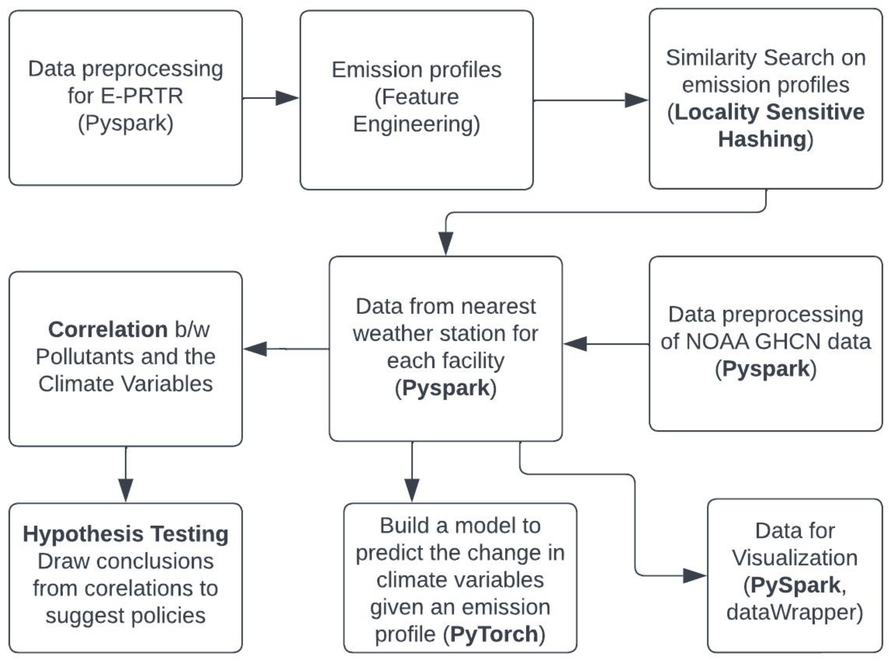
Method

Concepts:

1. Similarity Search (LSH)
2. Hypothesis Testing
3. Correlation Analysis
4. Predictive Model

Data Pipelines

1. Pyspark
2. Pytorch



Conclusion

Our project analyzed facility emissions and their climate change impact, proposing measures to prevent key emissions. A predictive model estimates the environmental impact of new facilities, while identifying similar facilities aids policymakers in implementing consistent policies. Hypothesis testing within groups provides insights for appropriate policies, leveraging existing regulations. These findings address and inform facility emissions' environmental implications.

References

[1] European Transfer Release and Transfer Register
[2] Gemstat dataset
[3] GLOBAL CLIMATE PREDICTION USING DEEP LEARNING
[4] How to query the NOAA GHCN Daily Weather Data
[5] Locality Sensitive Hashing
[6] WHO. (2016). Ambient air pollution: A global assessment of exposure and burden of disease.