



Abstract

The Energy Information Administration (EIA) is a government agency that collects and publishes data on coal consumption and quality beginning in 1972. Our group was tasked to synthesize this diverse data in order to make conclusions about recycling potential of coal fly ash that can be used to form decarbonized infrastructure materials. Interest in this field has been rising due to increasing pressure to live more environmentally consciously in the face of climate change.

Objectives

Our team's primary goal is using Machine Learning in order to create a model that is able to predict chemical properties of coal and resultant coal ash. Knowledge of chemical properties enables conclusions about recycling potential.

Methods

Data Cleaning: Important Standardization for Analysis

Missing Value Analysis: Fill in holes for necessary extrapolation

Time Series Analysis: Examining Data Trends

Machine Learning Approach: Model Generation to Create Predictions

Results

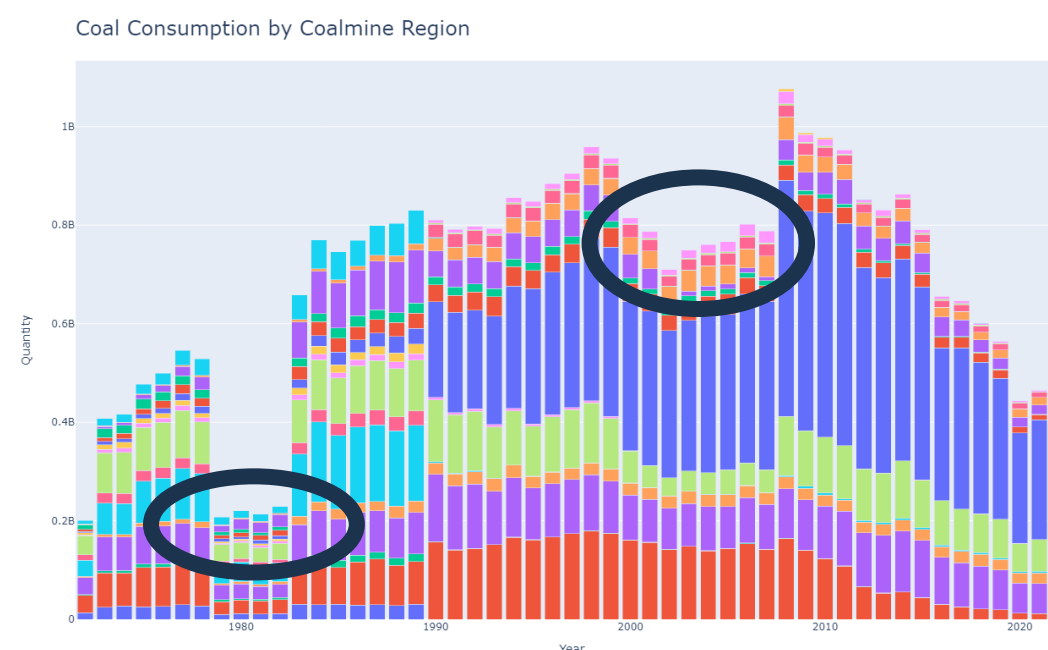
Data Cleaning:

EIA Excel Files from 1972 to 2022 containing fuel receipts



Standardized CSVs with consistent headers, d-type, etc.

Missing Value Analysis:



Missing values found in early 1980s and 2000s – necessitated remediation using missing value ratios

Time Series Analysis:

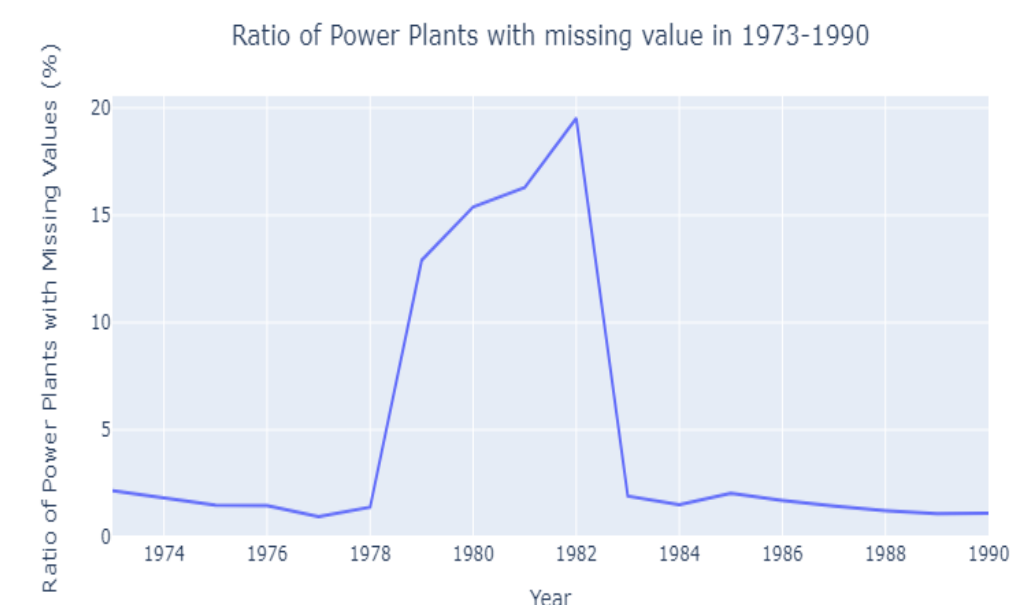
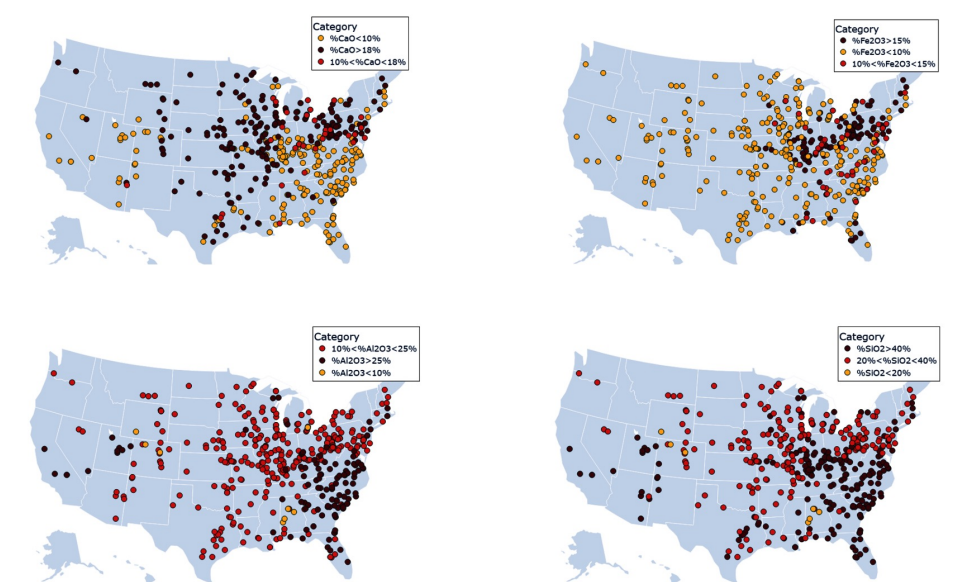


Time series analysis for Surface Mines in the UINTA Region

Conclusion

Final Machine Learning Model:

- Able to predict chemical properties of coal fly ash
- Conditioned on the hypothesis that average heat/sulfur/etc. content stays consistent
- Necessitates time series analysis for each region
- Validated by external data set (Future Work)



References

- Justman, D., Sabbatino, M., Montross, S., Pantaleone, S., Bean, A., Rose, K., & Thomas, R. B. (2022). A database and framework for carbon ore resources and associated supply chain data. *Data in Brief*, 40. <https://doi.org/10.1016/j.dib.2021.107761>
- Rivera, F., Martínez, P., Castro, J., & López, M. (2015). "Massive volume fly-ash concrete: A more sustainable material with fly ash replacing cement and aggregates." *Cement and Concrete Composites*, 63, 104–112. <https://doi.org/10.1016/j.cemconcomp.2015.08.001>

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