

# Demographic Drivers of Public Sentiment on Nuclear Energy

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## Research Question

How have energy policy preferences, public sentiment toward nuclear power, and nuclear electricity generation influenced one another over time in the United States, and do these relationships differ across political, educational, and generational groups?

- To what extent do the primary predictors of nuclear favorability shift across distinct chronological periods, and how does their relative influence evolve over time?
- Is there a model that presents clear advantages when predicting nuclear favorability, and if so, what kind of model?
- What variables are the strongest predictors of nuclear energy favoritism, and can those predictors be used to **forecast future nuclear generation sentiment**?

## Motivation

Public opinion toward nuclear energy has become increasingly important as the United States faces rising electricity demand, pressure to reduce carbon emissions, and renewed policy interest in reliable low carbon power sources, pressure to decarbonize. Topic of interest across energy policy, public opinion, and infrastructure planning. Stakeholders include electric utility companies, energy consumers, environmental organizations, nuclear energy/supply chain businesses, local communities, infrastructure funds, political parties, and researchers.

## Data

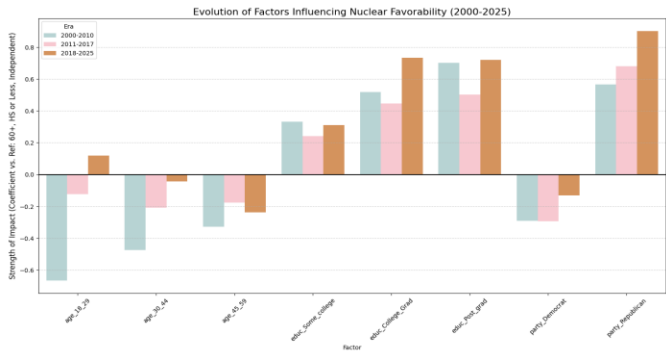
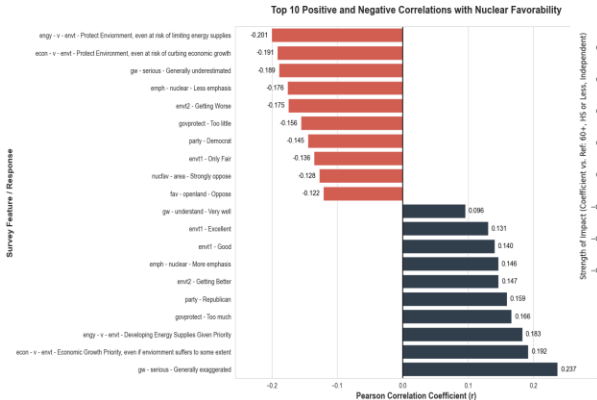
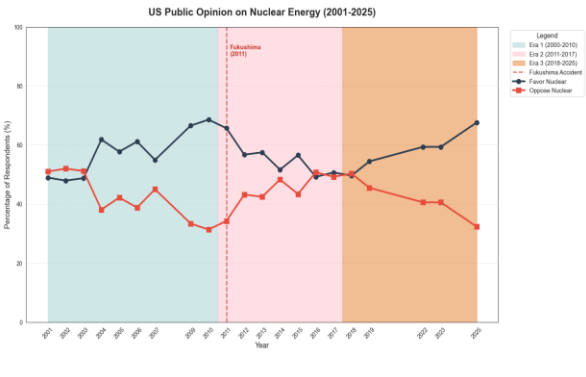
**Gallup Survey Data** (Gallup national surveys, a nationally recognized polling organization)

Includes about **11,000 individual responses** on nuclear energy support, political affiliation, age, education, environmental views, economic views, and religion.

**Nuclear Generation Data** (U.S. Energy Information Administration, Nuclear Energy Institute, and International Energy Agency. **Data Limitations**)

Covers **1971 to 2026** and included uranium prices, nuclear electricity generation, and nuclear energy's share of total U.S. energy production.

## Notable Visuals



## Methods/Model Selection

We explored 4 models: logistic regression, decision tree, neural networks, and SVM.

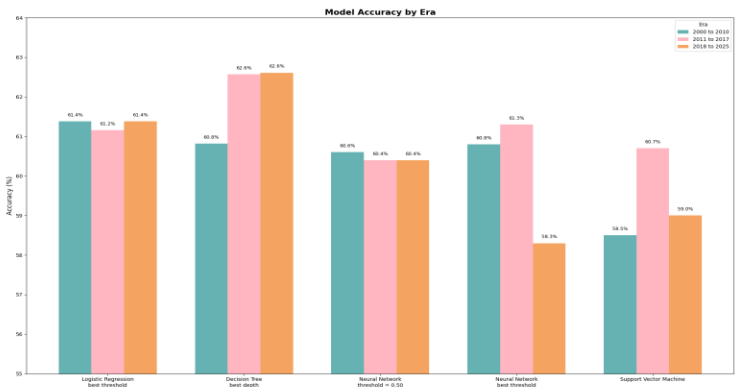
**Logistic Regression:** Classic classification model to analyze nonlinear relationships with feature engineering.

**Decision Tree:** Classification model useful for interpretability and handling mixed data types and nonlinear relationships (can overfit).

**Neural Networks:** Detects complex non-linear relationships, scales with large data (difficult to interpret), classification model.

**SVM:** Effective classification model with data with high quantity of features (hard to interpret).

## Results



|           | Logistic Regression                     | Decision Tree                           | Neural Network                         | SVM                                    |
|-----------|-----------------------------------------|-----------------------------------------|----------------------------------------|----------------------------------------|
| 2000-2010 | A: 61.38%<br>FPR: 26.44%<br>FNR: 12.18% | A: 60.82%<br>FPR: 20.22%<br>FNR: 19.38% | A: 60.8%<br>FPR: 58.57%<br>FNR: 24.96% | A: 58.5%<br>FPR: 49.09%<br>FNR: 35.85% |
| 2011-2017 | A: 61.16%<br>FPR: 29.52%<br>FNR: 9.38%  | A: 62.57%<br>FPR: 15.51%<br>FNR: 24.11% | A: 61.3%<br>FPR: 43.60%<br>FNR: 36.44% | A: 60.7%<br>FPR: 46.53%<br>FNR: 33.33% |
| 2018-2025 | A: 61.38%<br>FPR: 29.63%<br>FNR: 9.30%  | A: 62.61%<br>FPR: 24.95%<br>FNR: 13.33% | A: 58.3%<br>FPR: 64.20%<br>FNR: 22.11% | A: 59.0%<br>FPR: 33.12%<br>FNR: 46.82% |

## Conclusion/Future Work

Overall, the decision trees and logistic regression models performed the strongest overall. This may be partly because of their overall simplicity coupled with the small number of explanatory variables we were working with.

Based on the decision tree models, the single most important predictor for determining nuclear energy sentiment across all time periods is political affiliation, as all trees split on party first, classifying people as supportive of nuclear energy if they were Republicans.

Future work entails creating larger models to capture more of what surrounds nuclear sentiment. Some factors that come to mind are geographic location of survey respondents, occupation and income level.