

# Investigating U.S. State Poverty Rates (1995 to 2020)

## Capstone Project

By: Group 1

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# Exploratory Questions:

## Federal Level

1. How has the national U.S. poverty level changed between 1995 to 2020?
2. Is there a relationship between the U.S. national poverty level and: party control of the Senate, House, and President, inflation, or federal spending allocated to social services categories?

## Exploratory Questions:

### State Level

3. What factors influence poverty rates between 1995 to 2020 at the U.S. state-level?

4. Is state tobacco revenue, state alcohol revenue, or drug overdose rates related to state poverty levels?

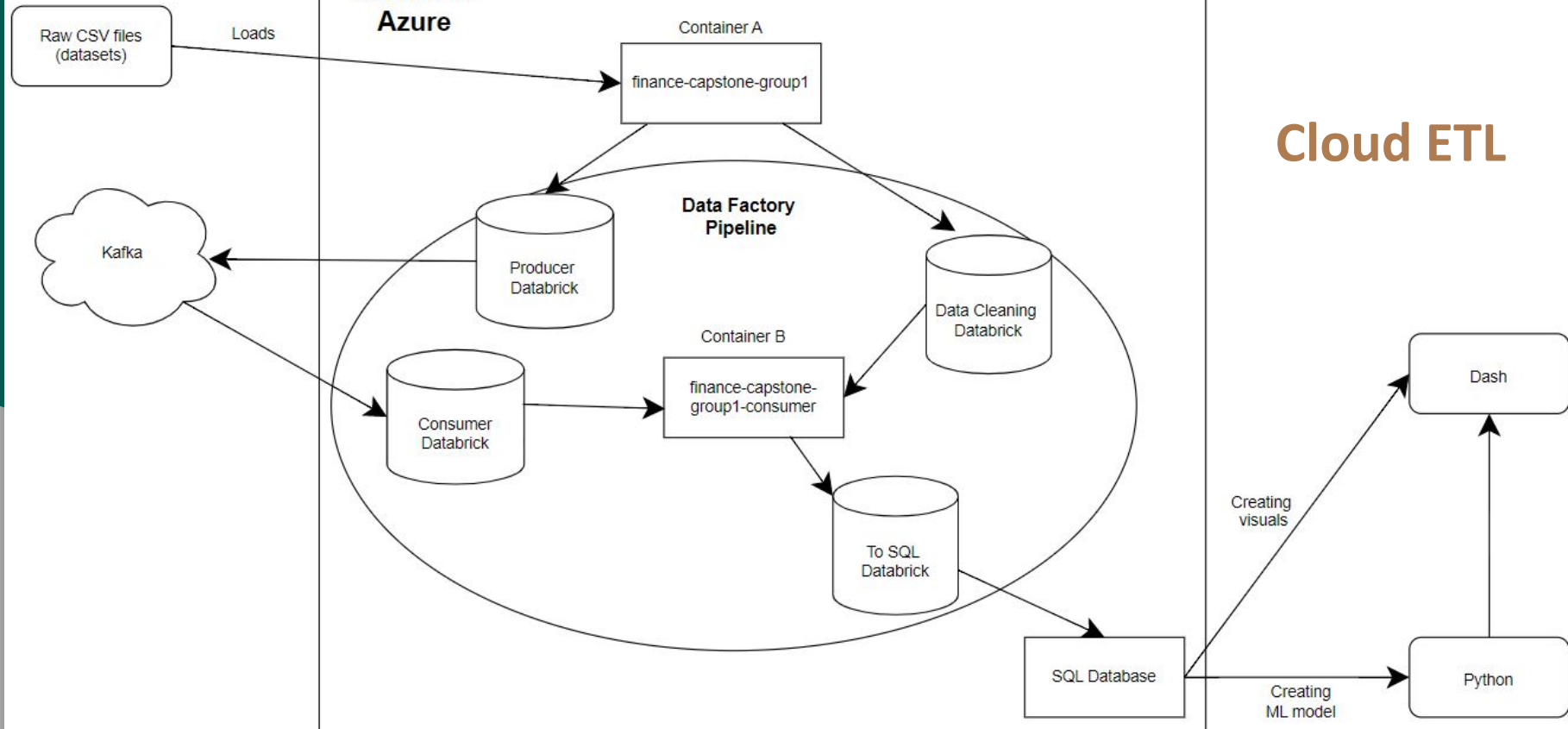
## Exploratory Questions:

5. Are state poverty levels and state education spending related?
6. Is there a relationship between state poverty levels and state social services spending?
7. Are we able to predict state poverty levels based on the factors explored in Question 3?

# Research Process & EDA

- Census datasets for state and federal spending & revenue
- Brainstormed factors related to poverty
  - Ex. Drug overdose, crime rates, party control, etc.
- Used data outside Census for these factors
- 1995-2020 focus to get most data for all factors
- Problems:
  - 1995-1998 drug overdose data mostly nulls
  - Some factors not relevant in all states (ex. Income tax)

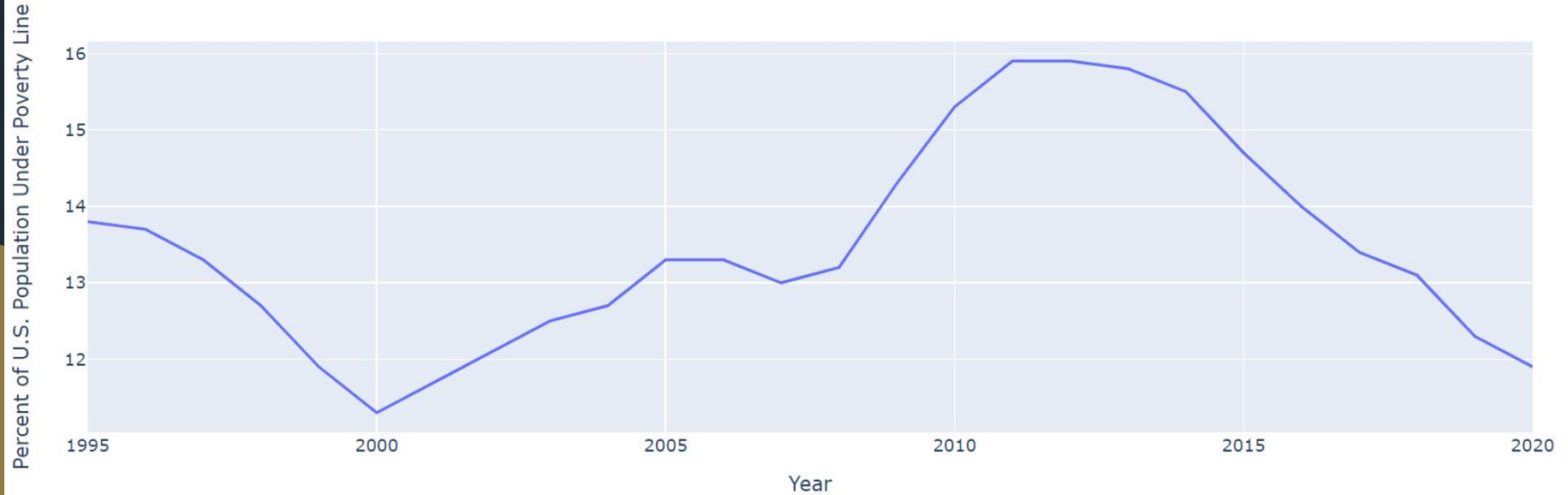
## Microsoft Azure



## Cloud ETL

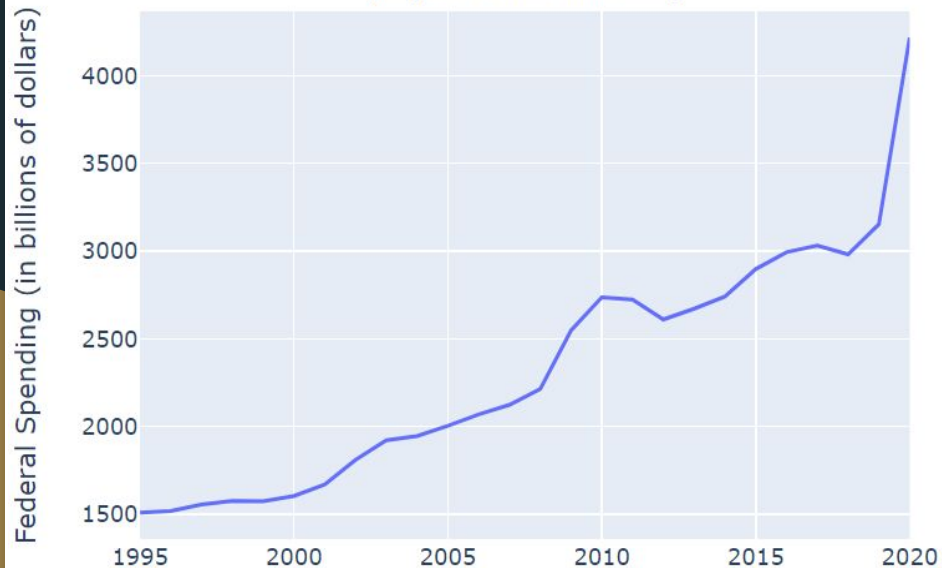
# Visualizations: Federal Level

**U.S. National Poverty Rates between 1995 to 2020**

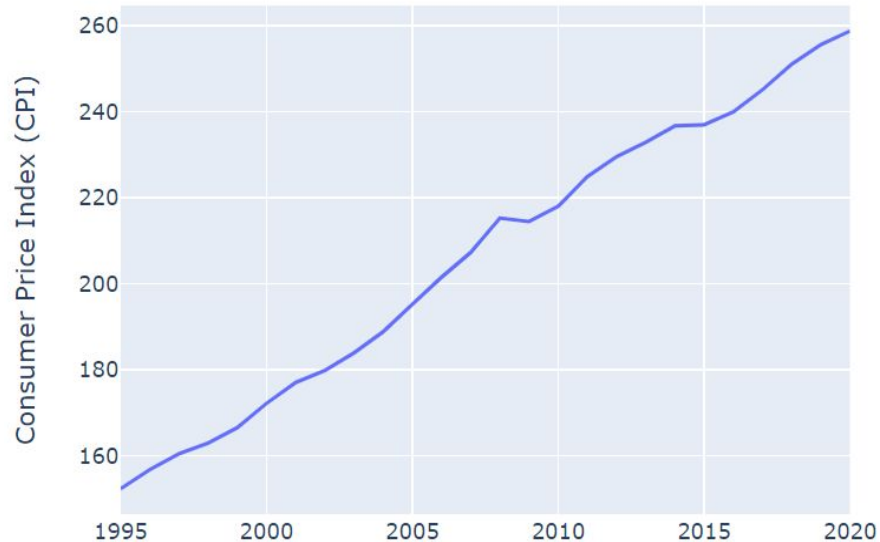


## Federal Government Spending on Medicare, Social Security and Other Payments to Individuals (1995 to 2020)

(adjusted for inflation)

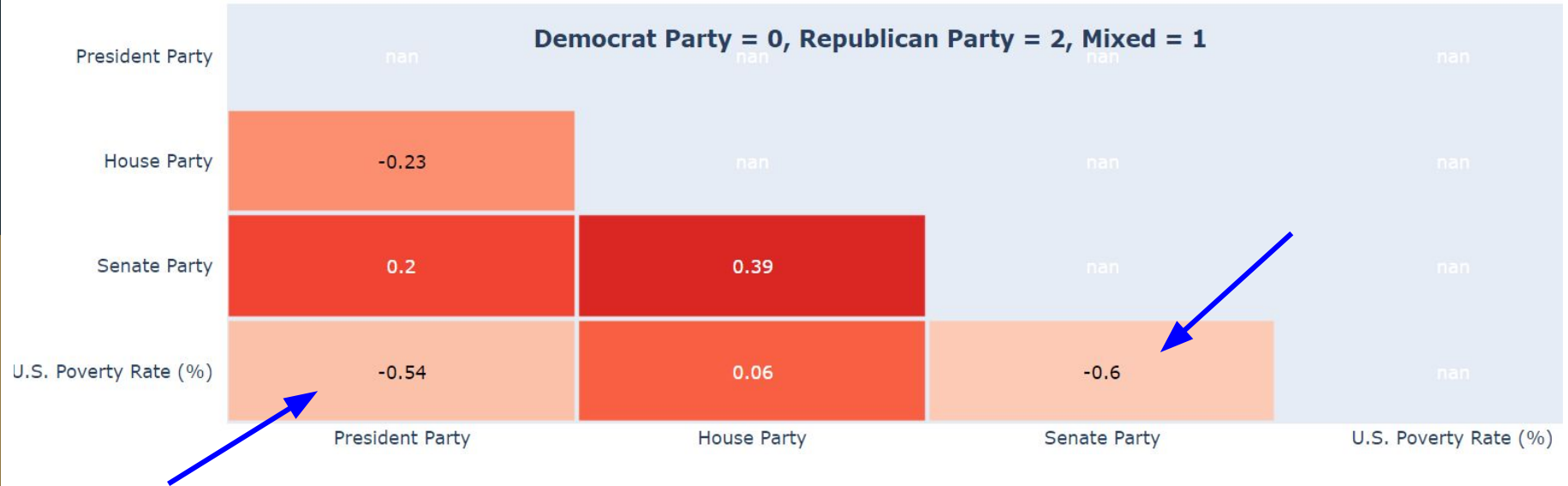


## Consumer Price Index (CPI) in the U.S. (1995 to 2020)



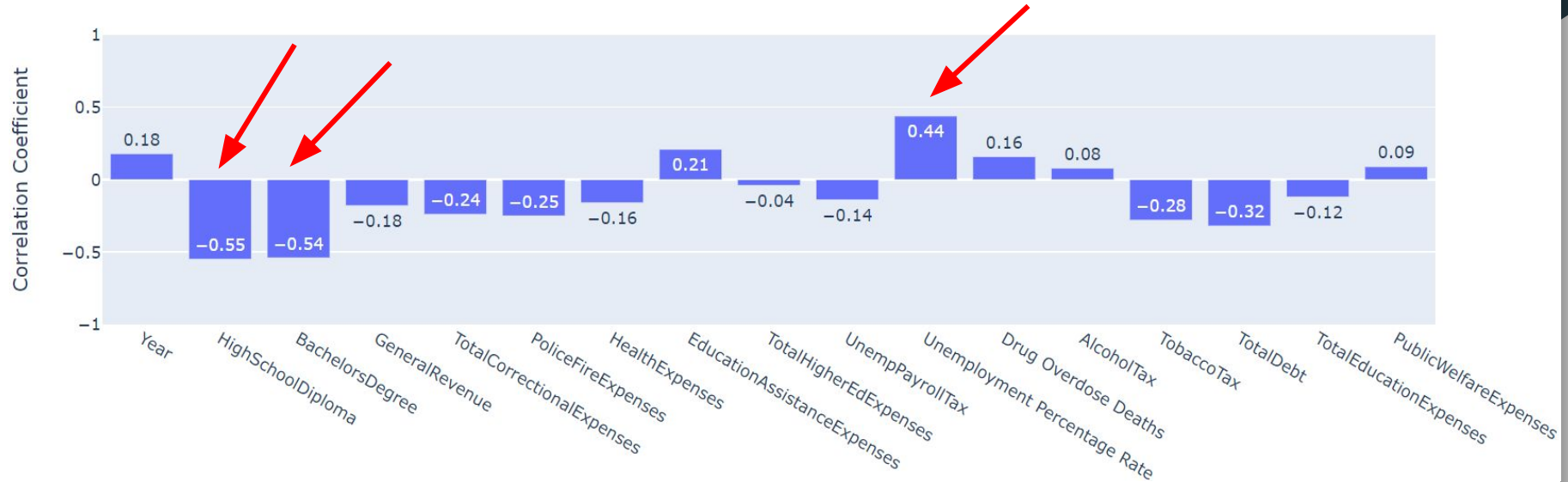


**Correlation Matrix:**  
**U.S. Poverty Rate and Party Control of President, House, and Senate**



# Visualizations: State Level

Correlation Coefficients of Factors Related to Poverty with Poverty Rates in U.S. States 1995-2020



**Percentage under Poverty Line vs.  
High School Diploma Rate by State**



**Percentage under Poverty Line by State vs.  
Unemployment Rate by State**

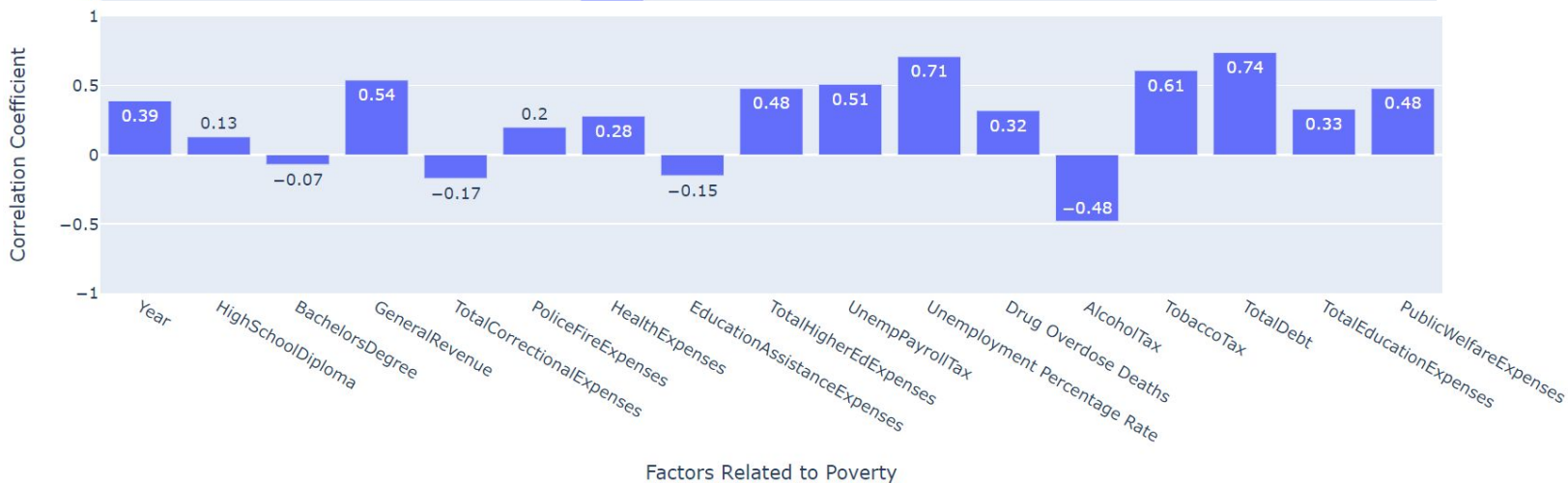


Correlation Coefficients of Factors Related to Poverty with Poverty Rates in U.S. States 1995-2020

New Hampshire



Mississippi



Factors Related to Poverty

# Machine Learning: LASSO Regression

**Goal:** Create a model that accurately predicts poverty percentages while also identifying features that most indicate or influence the presence of poverty

```
1 # Using grid search for ideal Lasso model alpha value:
2
3 lasso_params = {'alpha':[0.005, 0.01, 0.05, 0.1, 1]}
4
5 model = {'Lasso': GridSearchCV(linear_model.Lasso(), param_grid=lasso_params).fit(X, y).best_estimator_}
6 model
```

{'Lasso': Lasso(alpha=0.005)}

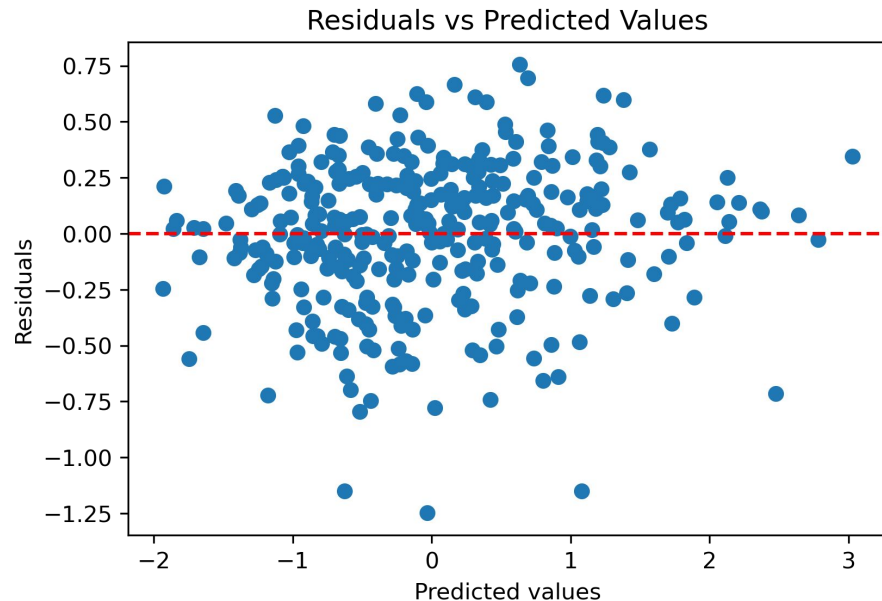
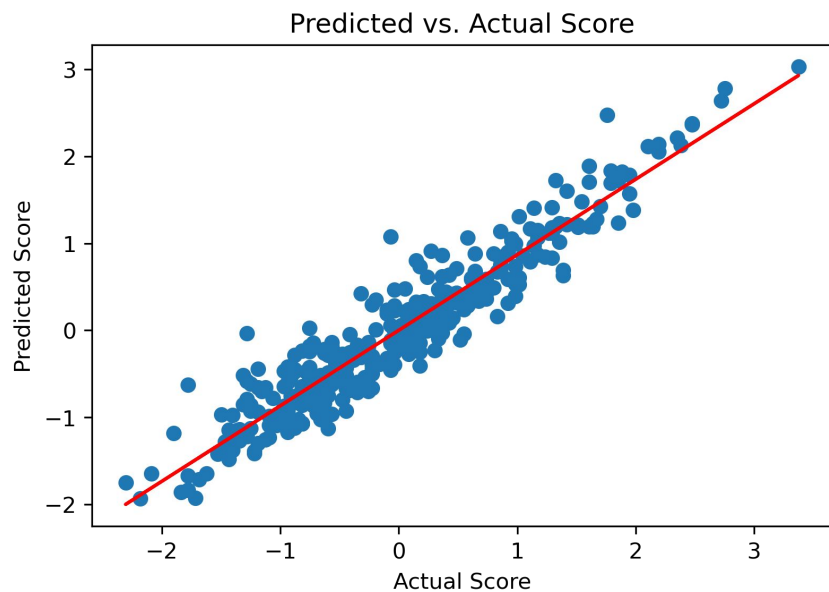
[+ Code](#) [+ Markdown](#)

```
1 # Applying Lasso machine learning model
2
3 lasso = Lasso(alpha = 0.005)
4 fit = lasso.fit(X_train, y_train)
5 y_pred = lasso.predict(X_test)
6 r2 = lasso.score(X_test, y_test)
```

# Model Tuning

- Balancing an alpha value that improves accuracy of model while also cutting features down to the most important ones
- Multiple years of missing data from one of our datasets covering state drug overdose rates, so we excluded years 1995-1998
- Dropped data on the District of Columbia since not all datasets included it

# Model Results



$$R^2 = 0.9011$$



# Government Policy Focus Recommendations

- **Educational Attainment**

- High School & Undergraduate
- Scholarships, school funding, relevant curriculum

- **Unemployment**

- Job technical programs, prompt local business growth

- **Drug Usage & Overdose Deaths**

- Addiction treatment, education programs, drug use and overdose awareness

# Sources

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