



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

Capstone Project

By: Group 1 Financial Services

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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?

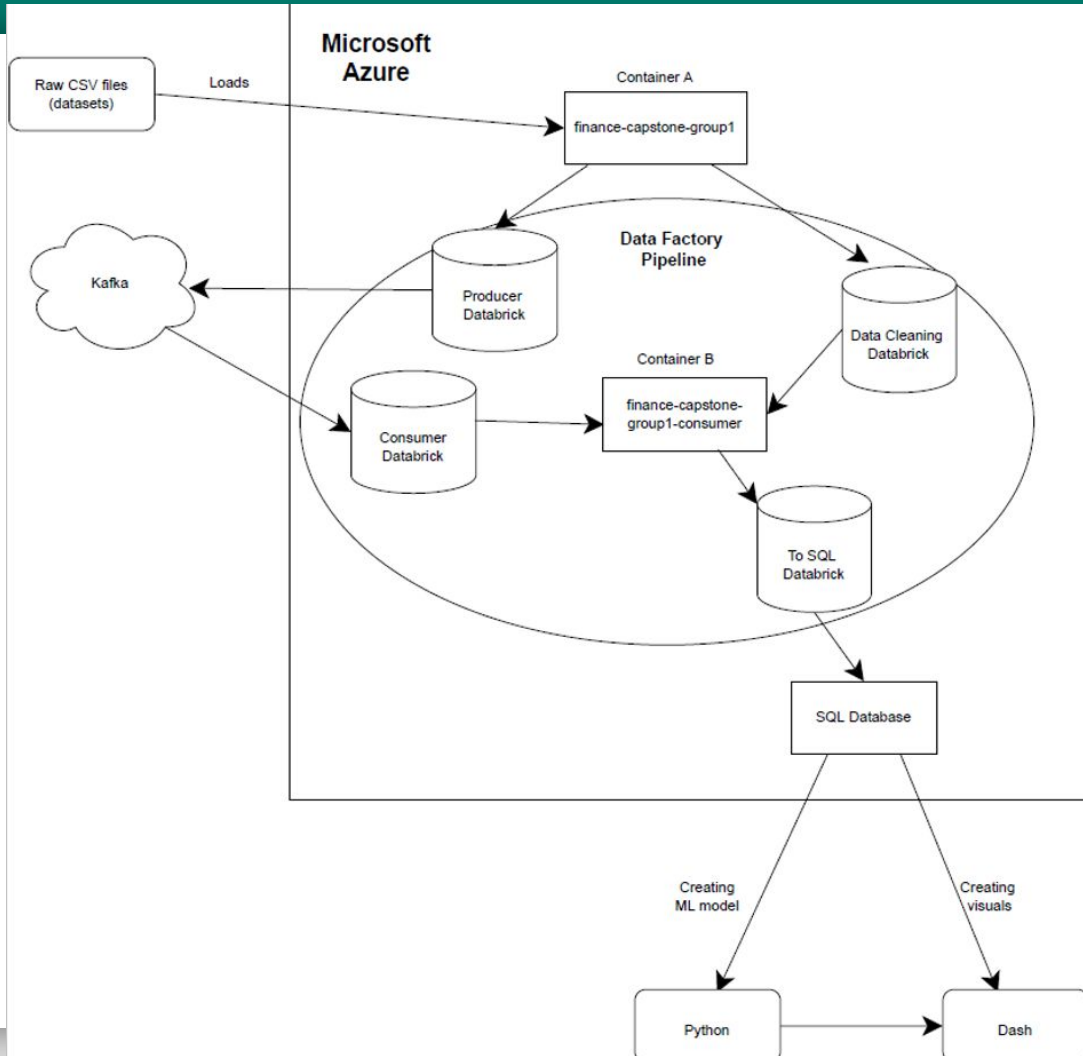
4. Is state tobacco revenue, state alcohol revenue, or drug overdose rates related to state poverty levels?

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

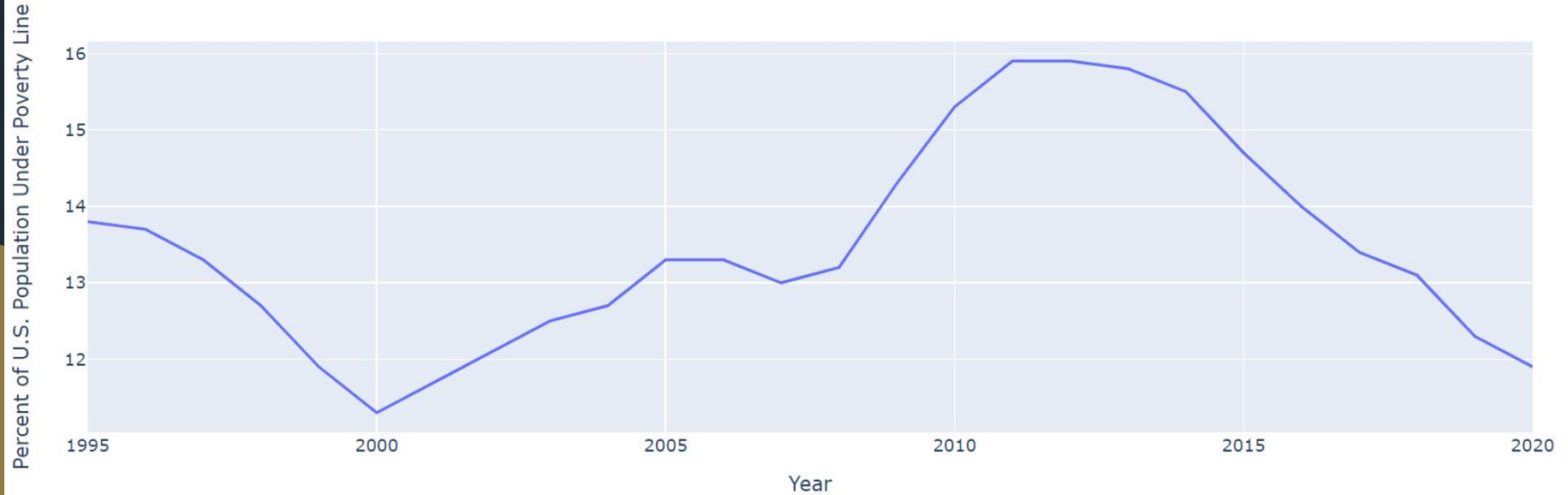
- Census datasets for state and federal spending & revenue
- Brainstormed factors related to poverty
 - Ex. Drug overdose, crime rates, party control, etc.
- Used data outside Census for these factors
- 1995-2020 focus to get most data for all factors
- Problems:
 - 1995-1998 drug overdose data mostly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



Cloud ETL

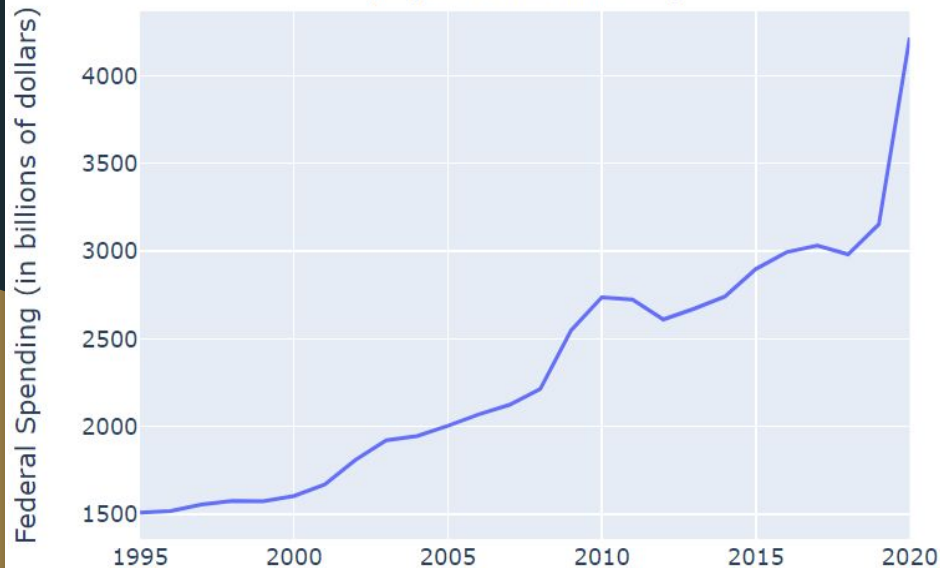
Visualizations: Federal Level

U.S. National Poverty Rates between 1995 to 2020

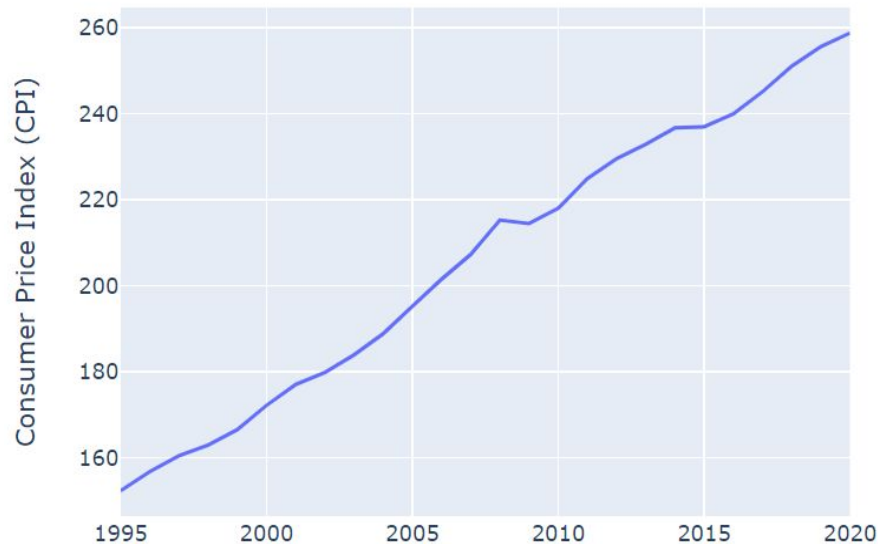


Federal Government Spending on Medicare, Social Security and Other Payments to Individuals (1995 to 2020)

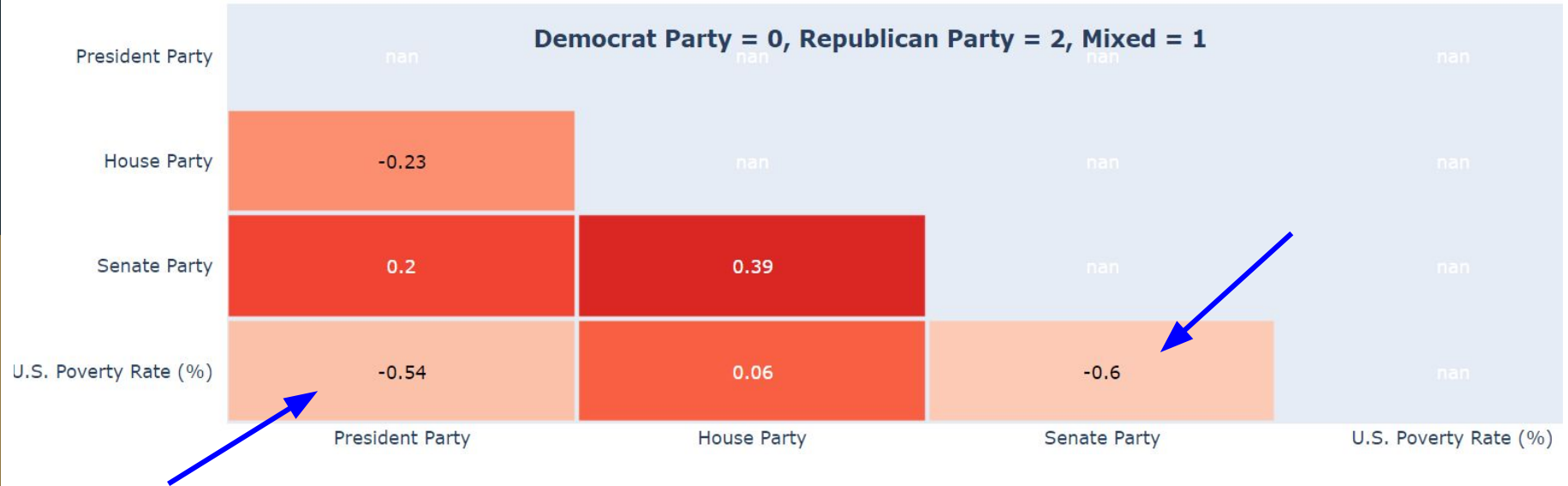
(adjusted for inflation)



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

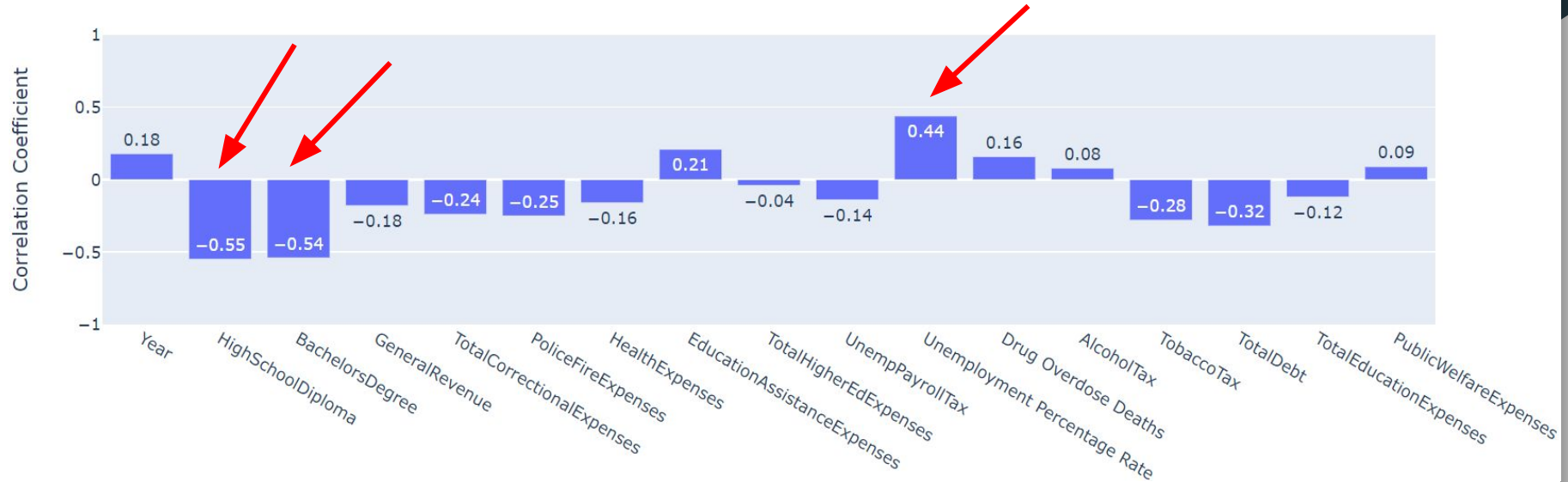


Correlation Matrix:
U.S. Poverty Rate and Party Control of President, House, and Senate



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**

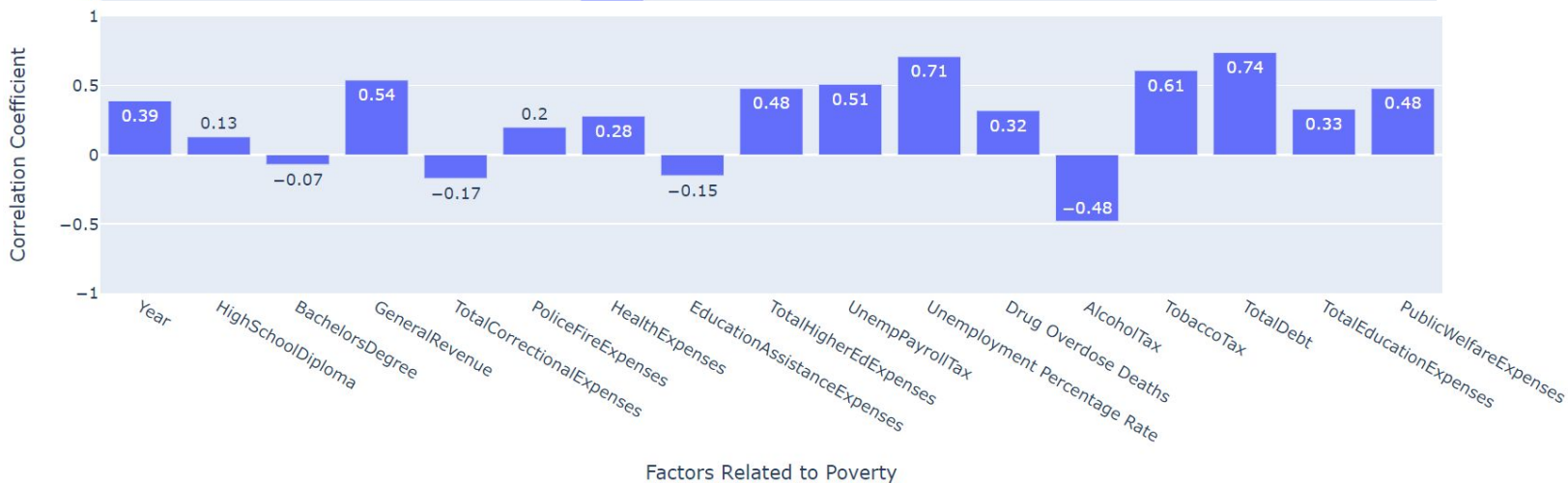


Correlation Coefficients of Factors Related to Poverty with Poverty Rates in U.S. States 1995-2020

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)}

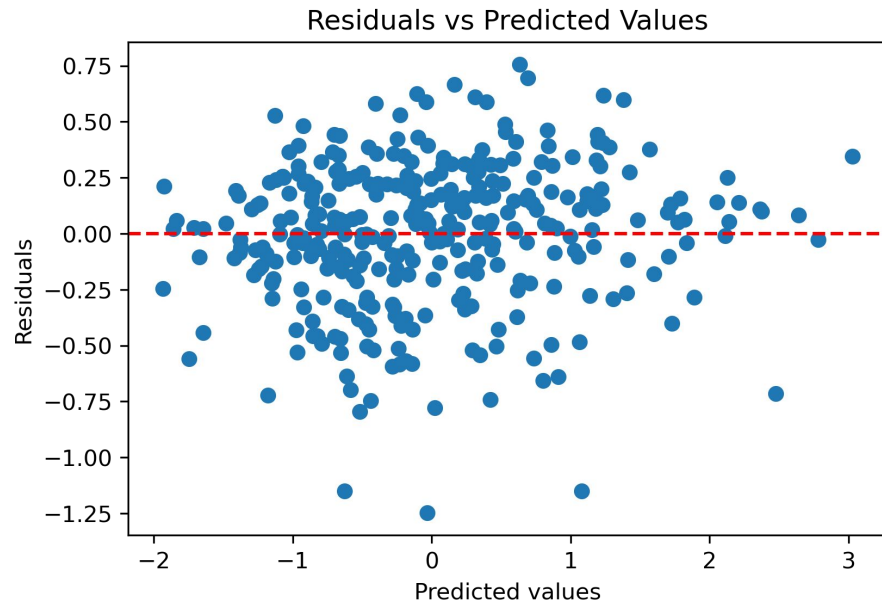
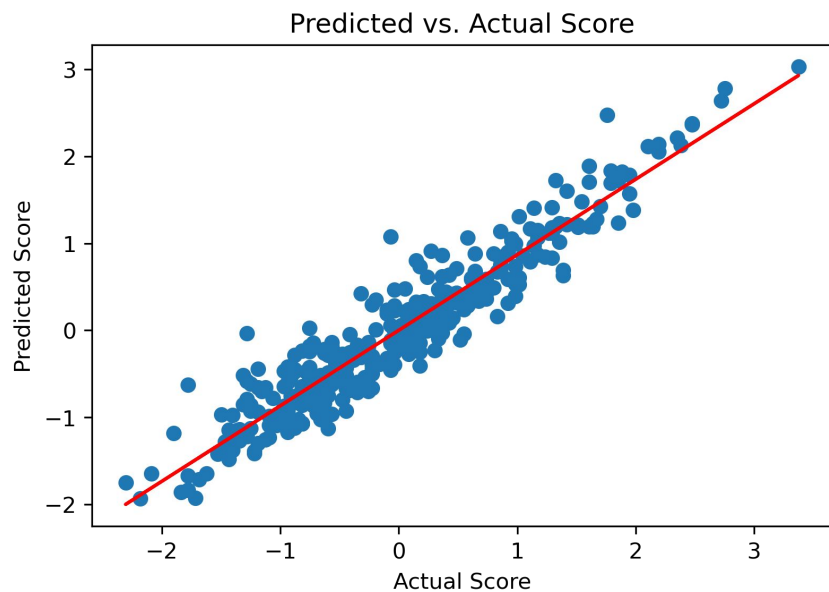
[+ Code](#) [+ Markdown](#)

```
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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