PolyData

ELECTORAL INNOVATION

Resources Breakdown

At-a-Glance

Arkansas

ELECTION RESULTS

JOSH

PRICE

SECRETARY OF STATE

WWW.POLYDATAELECT.ORG/RESOURCES

Executive Summary

The
PolyData
Electoral Innovation
Network

The PolyData Electoral Innovation Network is **a collection of Artificial Intelligence-based election analysis resources and other software tools** designed to improve activist organizations, political campaigns, and governmental organizations' ability to operate efficiently and support their constituents.

Mission Statement

"PolyData is focused on **empowering activists, political staffers,** and **communities** through promoting more **technological innovation**, interdisciplinary **research**, equitable **public service**, and **political advancement**."

- DINESH VASIREDDY
Founder & Lead Developer

Data Sources

Federal Election Commission

ANES
American National Election Studies

MIT ELECTION DATA + SCIENCE LAB

ArkDems

SEAL OF THE SECRETARY OF STATE ★ ARKANSAS ★

ESTABLISHED IN
2021

PARTNERS & CLIENTS SERVED
5

RESOURCES DEVELOPED
5

DATASETS ANALYZED
265

ACTIVE

U.S. Election Simulation & Prediction Models

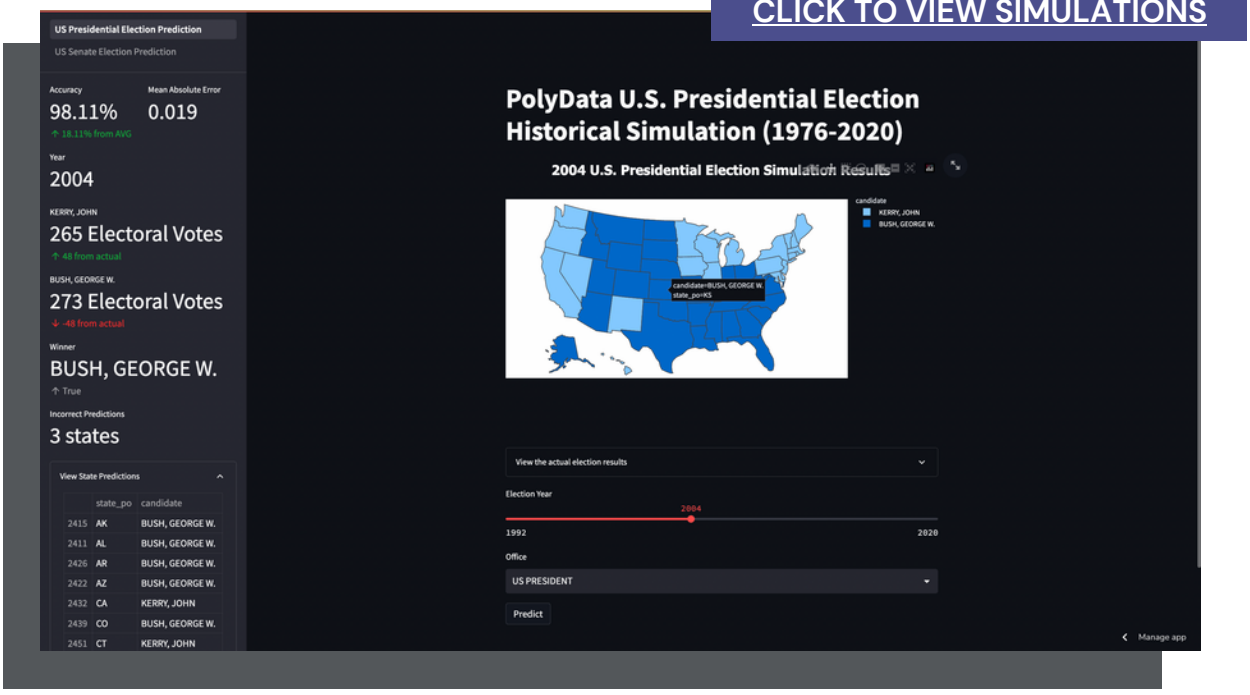
ONLY HISTORICAL DEMOS (1976-2020) AVAILABLE TO PUBLIC, OTHER MODELS EXCLUSIVE TO SPECIFIC POLITICAL CAMPAIGNS

This set of models was primarily developed in conjunction with multiple political campaigns (**Joshua Price for AR Secretary of State** and **Jesse Gibson for AR Att. Gen.**).

To predict and simulate various electoral outcomes through these models, federal election datasets from MIT's Election Data + Science Lab (President, Senate, House, etc.) were transformed into entirely numerical formats using LabelEncoders from sci-kit learn. Then, for each separate model, Random Forest Regression, an ensemble learning method that operates by constructing and iterating through multiple decision trees to reach a final prediction, was employed. These Random Forest models were continuously **trained with 70%** of their respective electoral dataset and tested on their **prediction accuracy** (via Mean Absolute Error, Mean Squared Error, etc.) using the remaining **30%**. Additionally, these models' hyper-parameters (n_estimators, samples, max_features, etc.) were optimized using the Bayesian Optimization algorithm, which employs another predictive machine learning model to repeatedly execute the target model's task and learn from each outcome until the hyper-parameter set that allows for optimal accuracy/error is found. In this way, we generated models (and accompanying visualizations) that presented:

- **Less than 5% Error** on **U.S. Presidential Election** Prediction and Historical Election Simulations
- **Less than 8% Error** on **U.S. Senate Election** Prediction and Historical Election Simulations
- **Less than 6% Error** on **U.S. House of Rep.** Election Prediction and Historical Election Simulations

CLICK TO VIEW SIMULATIONS



PolyData's Resources Explained

ACTIVE

Inactive Voter Identification Model

DEVELOPED EXCLUSIVELY WITH JOSH PRICE FOR ARKANSAS SECRETARY OF STATE, ALSO USED BY ARKANSAS UNITED

Developed exclusively with **"Joshua Price for Arkansas Secretary of State"**, this model focused on analyzing **historical election data** and **current polls** to **identify demographic groups that will likely be inactive in Arkansas elections.** Since there weren't any official comprehensive datasets with citizens' voting patterns and their demographic information, we **merged** an existing **dataset of demographic information for Arkansas' towns** (via U.S. Census and AR Economic Development Institute) **with state election results from 2004-2020** (via Arkansas Secretary of State's Office) to generate a rough demographic map of Arkansas' currently active electorate. We also **classified all towns in the dataset** as active (5), generally active (4), neutral (3), generally inactive (2), or inactive (1) based on their voting percentage. Then, we fed this dataset into a **Multilayer Perceptron (MLP) Neural Network**, which used a technique called back-propagation to adjust the weights of the neurons (layers) in the network to generate more accurate predictions. This MLP was tasked with projecting voting activity (1-5) in the upcoming 2022 state election for all towns in the dataset. In doing so, we found that areas with a prominent **Asian-American** population, specifically those with a large presence of Indian and Marshallese-Americans, were **projected to have the lowest electoral activity** in the 2022 Arkansas elections. This informed the campaign's voter outreach strategy and Mr. Price's future public service endeavors after the conclusion of his campaign.

ACTIVE

Franchise Structure Comparison Model

DEVELOPED EXCLUSIVELY WITH ARKANSAS UNITED'S IMMIGRANT RESOURCE CENTER PROGRAM

Developed exclusively with **Arkansas United's Immigrant Resource Center program**, this model was created to **extract information about non-profit organizations and social businesses' franchise(e) structures** from their websites and use that information to **determine the most ideal franchise structure for Arkansas United's IRC program** based on previously specified criteria/keywords. Using tools from the **BeautifulSoup Python library**, HTML and XML documents from more than 50 websites from non-profit organizations and businesses were parsed to extract relevant text and store them in a dataset (.csv format). To analyze and understand the collected text data, we employed the **BERT Natural Language Processing model** (Bidirectional Encoder Representations from Transformers), a unique deep learning model capable of reading and interpreting any text in both directions. This bi-directionality, enabled by the use of transformers, allowed it to dynamically calculate weights for different parts of any text and generate a more comprehensive understanding of any text document.

After applying BERT, we found that the **franchise structures** of the **'NAACP' and 'Boys & Girls Club'** were most suitable for **Arkansas United's IRC program** requirements, which we essentially input to the model through keywords and additional literature. Using the results of PolyData's Franchise Structure Comparison Model, Arkansas United designed and launched their optimized IRC program with **an improved application process, management structure, franchisee requirements, etc.**

ACTIVE

Demographic Electoral Data Report Generator

DEVELOPED EXCLUSIVELY WITH ARKANSAS UNITED AND DEM. PARTY OF ARKANSAS

Developed exclusively with Arkansas United and the Democratic Party of Arkansas, this **AI-based generator** was constructed to **generate electoral data reports** (basic statistics, understandable visualizations, relevant trend analysis, etc.) that **display demographic differences** and information. This resource is designed to be a more interactive software tool. When users upload a dataset (.csv format), **descriptive statistics** (means, standard deviation, quartiles, counts, percentages, etc.) are calculated and, to complement these statistics, visualizations (distributions, Venn diagrams, etc.) are also generated. In addition to descriptive statistics, a set of **predictive analytics** is also conducted, including **electoral forecasting** and **demographic-specific voting pattern prediction**. These operations are made possible through classification and regression-oriented machine learning models from scikit-learn integrated into this software. By automatically generating descriptive statistics and predictive analytics for any electoral dataset, this generator **allows non-profit organizations and social businesses to efficiently analyze and understand convoluted datasets.**

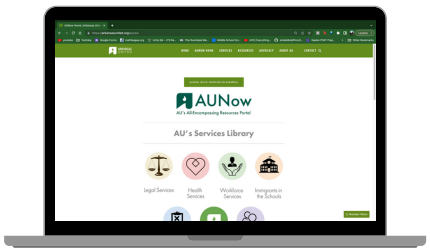
IN DEVELOPMENT

AUNow Immigrant Resources Portal

CURRENTLY BEING DEVELOPED EXCLUSIVELY WITH ARKANSAS UNITED

Unlike other PolyData resources, AUNow is not a machine learning model or a set of ML models, but rather a data and information management software. Developed exclusively with Arkansas United, AUNow is Arkansas United**'s All-Encompassing Resources Portal**. AUNow was made to provide AU staff, volunteers, members, and business partners with access to AU's most important services and information. Constructed with HTML and CSS (Front-End Visuals) along with **JavaScript** and **SQL** (Back-End Database Management), AUNow stores **information** about AU's various programs in the form of **web articles** while also hosting **a multitude of separate databases** for volunteer activity, workforce referrals, and available healthcare professionals.

So far, AUNow's informational resources have been published and are currently active on Arkansas United's website in English and Spanish. We are also in the process of launching AUNow's various databases online with **Google Firebase** integration.



CLICK TO LEARN MORE ABOUT AUNOW

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