

# FundFlow: Interactive UC Davis Budget and Expenditures Analysis & Forecasting Tool with Public API Access

## Project Features

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FundFlow promotes financial transparency for the UC Davis community by providing intuitive and interactive visualizations of the university's budgeting, endowment, expenditures, and impact on demographic & diversity changes over time. Using time series forecasting method, it makes forecast of future fiscal year data based on historic (recent) trends, and also highlights the year-over-year (YoY) changes in endowments, etc. It allows users to easily identify trends and anomalies – which are hard to find and interpret in the original table formatted dataset.

In addition, the platform encourages further analysis and forecasting by providing public API endpoints that queries specific values, returning them in JSON format. This eliminates the need for developers and analysts to parse data manually – a work that needed to be done to build FundFlow (given that the original dataset often contained data hard to extract through common formats).

## Methods

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Data was collected and parsed from the public datasets provided by the University through AggieData, and some fields from various datasets were merged to produce more comprehensive representation. There are stored as .js files, and recharts react library was used to generate the visualizations on the frontend.

For future forecast of funds, single exponential smoothing (SES) technique was used. SES calculates the moving average, and takes a value of random variation between -15 and +15, which is added to the sum of last smoothed value, and trend to calculate the next forecast value. The smoothing factor  $\alpha$  was set to 0.5.

$$F_{t+1} = S_t + T_t + \varepsilon_t \quad (1)$$

$$\text{where: } S_t = \alpha \cdot F_t + (1 - \alpha) \cdot S_{t-1} \quad (2)$$

$$T_t = \frac{F_t - F_{t-2}}{2} \quad (3)$$

$$\varepsilon_t \sim U(-15, 15) \text{ and } \alpha = 0.5 \quad (4)$$

For the other variables (enrollment, diversity index, and URM), linear forecasting technique was used with the formula  $Y_{n+t} = Y_n + \text{slope} \cdot t$ .

## Interpretation & Impact

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The analysis reveals inconsistent per-student funding ratio between the four colleges – College of Agricultural & Environmental Sciences, the second largest college by enrollment count, had the highest value at \$37k per student, exceeding the UC average of \$32k. The rest fell below the average.

Based on the demographic trends, the diversity index is on the rise, with increase in Latino students and decline in White students.

Between 2021 and 2022, the total endowment decreased by 6%, with decline in almost all categories but 4. From 2022 to 2023, endowment on "Unassigned" category increased by almost 15x.

For 3 of the 4 colleges (College of Biological Sciences, College of Engineering, and College of Letters & Science), the expenditures far exceeded the allocated Endowment Market Value by Unit. College of Agricultural & Environmental Sciences is the only college where the expenditure is only a portion of the endowment and doesn't exceed.

College of Letters & Science had interestingly the highest proportion of expenditure spent on Academic Salaries & Wages, at 59% and 56.7% respectively in 2022 and 2023, far exceeding the median of 47.2% and 45.13% in those years.