



Colorado Science and Engineering Fair

2025 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: SchoolFinance: A Novel Machine Learning Framework for Optimized School Funding Allocation

Finalist's Name: Alexander Zhang

School and City: Fairview High School, Boulder

Sponsor's Name: Paul Strode

Category: Behavioral & Social Sciences

Division: Senior (grades 9 - 12)

Abstract (250 words or less):

Education funding in the United States is becoming increasingly scarce and unequal, with budget cuts in hundreds of districts leading to increased resource disparities among underprivileged demographics. This research seeks to address these issues by developing a machine learning framework to optimize school funding allocation at the district level, using data from public schools in Colorado as a case study. Using a novel dataset of financial spending metrics and academic performance indicators (such as student growth percentiles from assessments like CMAS, PSAT/SAT, and ACCESS), Recursive Feature Elimination with Cross-Validation (RFECV) was applied to identify 37 key features that most significantly impacted student performance, like operational spending and the percentage of students eligible for Free or Reduced Price Lunch. These features were used to train a random forest model which achieved an R2 score of 0.83, reflecting strong predictive capability. By simulating different price levels and predicting the composite performance at each price level, the model was able to determine the slopes/spending efficiency of each school (the change in composite performance vs. the change in school funding) via linear regression. A pilot test in two districts: Boulder Valley Re 2 and Jefferson County R-1, demonstrated clear differences between the spending efficiencies of schools, and budget comparisons allowed for both inter- and intra-school reallocation. A simulation applying the SchoolFinance model across all Colorado districts showed it could reverse declining student performance, improving aggregate student growth from -0.8% to +0.45% without requiring additional funding.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature:

Date:

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. **A signed copy of this form must be included in your notebook.**