



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: Blazing Bright: Uncovering the Truth Behind Wildfires in CO via Machine Learning

Finalist's Name: Wensen Fang

School and City: Summit Middle Charter School, Boulder

Sponsor's Name: Peter Teasdale

Category: Mathematics & Computer Sciences

Division: Junior (grades 6 - 8)

Abstract (250 words or less):

Each year, millions of dollars are spent on wildfire damages in Colorado alone due to wildfire-related accidents. Despite the most advanced models to predict wildfires, generally, frameworks falter and fail to predict the fluctuating wildfire patterns. Whatever the cause, it is interesting to note that among all factors, temperature and precipitation are most highly correlated to wildfire frequencies throughout regions in Colorado. Annual average temperature (F) and precipitation (inches) data were obtained and correlated to wildfire frequencies (# of wildfires that occurred) in each county of Colorado from 2000-2024 and analyzed with a Pytorch coded neural network to determine which factor -- temp or precipitation -- had a larger correlation to wildfire frequency. R^2 values for the annual average overall temp vs precipitation of Colorado, wildfire # vs temp data (approx. 2000; data from each year and from each county), and wildfire # vs precipitation data, were, respectively: 0.015, 0.006, and 0.008. Error training function for temperature model took a linear path and was unable to fit data/plateau down, whilst precipitation model was able to plateau at ~10 epochs (extremely quickly). Mean absolute error (MAE) between predicted and actual wildfire numbers calculated from neural network using temp data was on average 73.837, whilst with precipitation data MAE was 73.265 (in wildfires). Decreases in precipitation had a higher correlation to wildfire # compared to temperatures. However, neither of the correlations was "strong"; the extremely low R^2 values suggest no correlation between solely temp or solely precipitation to wildfire #s. Similarly, although the MAE values had no statistically significant difference, which can be derived in part due to the slight correlation between temp and precipitation, precipitation had a slightly higher correlation as compared to temperature. This is further emphasized in the training graphs, where the model was able to fit a model to the data quicker with precipitation data (thus a stronger, immediate correlation) than it could for temp data (which makes since-- temperature requires a long period, to take effects on the surrounding environment/starting a wildfire; much more complicated correlation). Further data, including factors wind speed, vegetation, elevation, etc. would be targeted in future research to find definitive correlations and patterns.

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.**