



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: The PetProfiler: Machine Learning and Mechanics for a Smart Doggy Door

Finalist's Name: Mateo Feit

School and City: Fairview High School, Boulder

Sponsor's Name: Adam Feit

Category: Engineering

Division: Senior (grades 9 - 12)

Abstract (250 words or less):

Wildlife endangerment to pets is a large concern, especially in areas near the wilderness. Traditional dog doors have unrestricted access, potentially putting pets at risk and allowing unwanted animals to enter the home. Further, RFID dog doors rely on tag-based authentication and become useless if the tag is lost or stolen. This project aims to be an accurate, automated, and secure dog door solution that uses machine learning to identify and grant pets access to the home while keeping unrecognized animals out. I engineered a custom PyTorch convolutional neural network(CNN) and developed the PetProfiler, a smart dog door with a camera that inputs a frame into my CNN every three seconds, as well as a motorized pinion-and-rack mechanism for automated opening and closing. My CNN was trained on pictures of my dogs Dante, Snaggletooth, and Chico, as well as counterexamples found in Colorado, like mountain lions, coyotes, and other dogs. Further, my CNN is able to learn specific features of my dogs and differentiate between them and other animals. In real-world testing, as of March 1st, 2025, the PetProfiler recognizes false animals ~89.8% of the time and discerns my dogs ~79% of the time on its first attempt, with ongoing improvements expected. The PetProfiler innovatively provides an accurate, automated, and secure alternative to traditional and modern RFID doors.

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.**