# Design and Development of an Autonomous Wildfire Suppression Firefighting Robot

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My science fair project works towards creating a hardware and software platform for automated AI-assisted fire suppression. Through a combination of an AI model, self-generated training data, sensor based decision making, and onboard data processing, I have created a firefighting robot platform that can be expanded to real-world scenarios such as building safety testing and autonomous firefighting robots for wildfire suppression. In the actual embodiment of making a prototype, I divided my project into hardware platform development, software development, and experimentation to find the best combination of materials that resist fire and keep internal electronics at manageable temperatures where external temperatures can reach above 500°C. I equipped the robot with YOLO v8n, a lightweight live image detection model; a thermal imaging camera that detects heat signatures of fires; and an extinguishing module. I also experimented with materials that resist heat through insulating or reflective properties and hypothesized that a combination of an outer reflective layer, an insulating middle layer, and a heat-absorbing inner layer will best protect electronics. To test this, I developed my own test method using a metal box that would be heated by a flame torch, and an embedded thermocouple would measure the time to reach 50°C or the temperature reached at 10 minutes. Results showed ceramic insulation performed best, while fiberglass reflected heat most effectively. I combined different layers to develop the most robust combination for fire protection.

**Awards Won:**

Patent and Trademark Office Society: First Award of $500