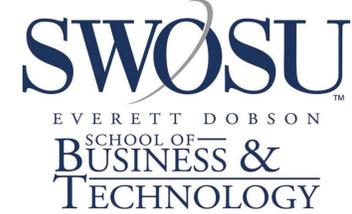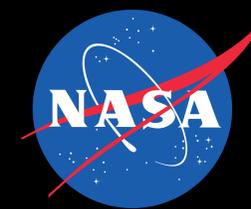# Advancements of Autonomous Applications
## Southwestern Oklahoma State University

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## Abstract

This material is based upon work supported by the National Aeronautics and Space Administration under Grant Agreement No. 80NSSC20M0114 issued through Oklahoma Space Grant Consortium. This research is in support of the Fire Dawgs competition team for this year's SpeedFest competition at Oklahoma State University. This NASA OK Space Grant Consortium funded competition team will compete in the Charlie Class, where an autonomous vehicle will navigate a course and put out a fire.

Robots and self-driving vehicles are useful, especially for hazardous jobs, such as firefighting. The use of high-tech sensing technology is a small part of how self-driving vehicles and robots can sense the world around it. Artificial intelligence or machine learning allows robotic machines to interact with the environment. More powerful sensors and computing allow robotic machines to perform more advanced tasks, allowing developers the ability to imprint human features and capabilities in them. Two examples of this include autos and manufacturing. Autonomous cars use this application for object avoidance and industrial robots use to stop motion when a person gets too close for safety. Researching and programming sensors to make a remote-controlled vehicle drive autonomously, activate object avoidance, navigate environments, and detect distance from a fire. Industrial robots are collaborative robots that uses sensors to share a workspace with humans.
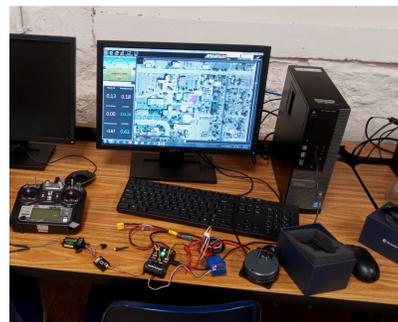
The goal of this NASA mission is to support the pipeline related to research done at NASA and in the Aerospace Industry. At SWOSU, we are currently gathering data for use in machine learning applications. The data comes from the robotic vehicle used for the firefighting competition. We will use this data to examine machine learning tools. This will grow our understanding of how to make this process work and prepare our students for careers using machine learning in the aerospace industry.

## Fire Dawgs

Fire Dawgs is the competition team that is competing in the SpeedFest competition at Oklahoma State University. Our goal is to build and program a fully autonomous vehicle to maneuver a course and safely extinguish a fire. We are applying engineering and programming skills to accomplish our goals. Our competition is April 23, 2022, in Stillwater, Oklahoma. The Fire Dawgs team is funded by the Oklahoma NASA Space Grant Consortium and supported by the National Aeronautics and Space Administration.

## Progress

The Fire Dawgs competition team has made tremendous progress over the past year. Our objective is to build a fully autonomous fire-fighting vehicle that can navigate a course and extinguish a fire. At this moment, our goal is to make the vehicle drive to a GPS point that is preselected on a map. We have built the body of our vehicle and fashioned it to support a fire extinguisher. The body of the car is designed to provide structure and evenly distribute the weight on all four tires. The fire extinguisher is going to be programmed to shoot retardant at a pan of Jet A fuel. To make our car drive autonomously we have equipped it with a Pixhawk 4. The Pixhawk includes a GPS module, compass, and an accelerometer. We have attached servo and a telemetry module to the Pixhawk so we can speak and control the car through the Pixhawk.



## Applications of Autonomous Automation

- Completing hazardous jobs or tasks using robots
- Using high-tech sensing technology to allow robots to sense the environment around it
- Machine learning and artificial intelligence allows robotic machines to interact within its environment
- Autonomous cars use object avoidance
- Industrial robots use stop motion
- Improve cobots to work safely with humans in the workspace
- Increase cobot use in different industries to improve productivity and safety

## Future Goals

- The Fire Dawgs are competing at SpeedFest at Oklahoma State University
- Researching and programming sensors to make a remote-controlled vehicle
  - Drive autonomously
  - Activate object avoidance
  - Navigate different environments
  - Detect distance from a fire
- Gather data from our robotic vehicle for use in machine learning applications
- Grow an understanding of how to make this process work
- Increase understanding of machine learning and artificial intelligence

## Works Cited

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