

**The STEM CENTER at SHSU**  
**Teaching Enhancement Grants Application**

**1. Title:**

Scholarship of Teaching and Learning: Use Unmanned Aerial Vehicles for image collection and analysis.

**2. Applicant (PI):**

Gang Gong, Associate Professor, gxg002@shsu.edu

**3. Current and Pending funding related to this project:**

None

**4. Budget:**

Funds requested \$1,892.

**5. STEM Course targeted in the proposal:**

GEOG 4468.01 Remote Sensing

GEOG 4468.02 Remote Sensing Lab

Expected Enrollment in Spring 2022: 15-20

**6. Project Narrative:**

**6.1 Executive Summary:**

This project aims to introduce the Unmanned Aerial Vehicles (UAVs) technology to students in the Remote Sensing class. Students will learn and gain hands-on experience in operating UAV as a remote sensing tool to collect remotely sensed imageries and develop skills in processing UAV images into information assets that support applications where data of high spatial and temporal resolutions are required. Specifically, students will operate UAV multiple times throughout the semester to collect multi-temporal aerial images of local areas of interest including SHSU campus. Students will then perform geometric correction, supervised classification, and landcover change analysis using the images collected. The images collected (in Spring 2022 and onward) will also form a long-term image collection of SHSU campus and local area. The dataset will provide valuable support for any research and planning activity where detailed aerial images are needed. Overall, students will develop a deeper understanding of the data collection mechanism in remote sensing and obtain more experience in digital image processing skills required by the relevant job market.

## **6.2 Rationale:**

Recent developments in the technology of Unmanned Aerial Vehicles (UAVs) have opened up important new possibilities in the field of remote sensing. Compared to pilot-flown aircrafts and Earth-orbiting satellites, UAV provides a brand-new platform for image collection. It makes it possible for image acquisition to be where and when you want it and at great affordability.

The developments in UAV have also led to fast growth in the applications. UAV now has been widely used in agriculture, ecology, forestry, resource management, and disaster response, etc. The demand for knowledge of UAV has grown steadily in recent years in the relevant job market. It has become necessary to include UAV in our existing curriculum.

The PI will teach GEOG 4468 Remote Sensing and the lab in Spring 2022. The class covers the general principles of remote sensing and digital image processing techniques. Students in the class will participate in the project and have the opportunity to learn to operate UAV, collect and process aerial images, and be familiar with the regulatory requirements.

## **6.3 Materials and Methods:**

Two DJI Mavic Air 2 drones will be purchased for this project. Students will form four groups and take turns to operate the two drones. Aerial images will be collected at multiple areas of interest in Huntsville with a focus on SHSU campus. The temporal resolution of image acquisition has been tentatively set at three weeks depending on the class enrollment and the rotation of groups.

Due to the inherent distortion in aerial image collection, a geo-registration (geometric correction) procedure will be designed to process the aerial images collected. Students will then use the registered images to perform a number of digital image analyses including supervised classification, change detection, and landcover change analysis.

The PI also intends to continue the project in the future semesters. The images collected in each semester will be archived and form an image collection of SHSU and the local area. It will benefit any research that may need local images.

## **6.4 Expected Results and Dissemination Plan:**

The expected results from this project will be a collection of local images. Students will gain experience in UAV operation, image collection, and image analysis. The image collection will be made available to the public over the internet. The overall project experience in teaching enhancement will be submitted for publication in Journal of College Science Teaching.

## **6.5 Budget Justification:**

PI stipend: none.

The project requires 2 DJI Mavic Air 2 drones:  $\$866 \times 2 = \$1732$

and 2 256GB microSD Memory Card:  $\$80 \times 2 = \$160$

Total funds requested: \$1,892.