

# GEOG 5570 – Special Topics in GIS: LiDAR Applications

Spring 2021. Remote asynchronous class.

Dr. Pinliang Dong

Professor, Department of Geography and the Environment

University of North Texas

ENV 310B, Phone: (940) 565-2091

E-mail: [Pinliang.Dong@unt.edu](mailto:Pinliang.Dong@unt.edu) URL: <http://geography.unt.edu/~pdong>

Virtual Office Hours: Mon 11 am – 12 pm, Wed 7:30 – 8:30 pm, or by appointment.



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**Prerequisites:** Consent of department.

## **Objectives**

Light detection and ranging (LiDAR) has been widely used to solve problems in the natural and built environments. This course introduces LiDAR principles, data processing methods, and applications in forestry, urban environments, and geosciences. It includes lectures, demos, hands-on exercises, Esri tutorials, and a course project. It is for those who have worked with vector and raster data using Esri's ArcGIS. Students will develop skills to effectively use LiDAR data in a geographic information system environment for solving real world problems.

**Required Textbook:** *LiDAR Remote Sensing and Applications*, CRC Press/Taylor & Francis Group, 200 pages. Authors: Pinliang Dong and Qi Chen (2018). ISBN: 9781138747241, or 9781482243017.

**Software:** ArcGIS Desktop 10.7, with 3D Analyst, ArcScan, and Spatial Analyst.

## **In-Class Exercises**

A total of 8 labs and 11 hands-on projects will be provided. Step-by-step instructions for the projects are available in the textbook. Students have two weeks to complete each hands-on project and submit results to Canvas. Late submission will be marked down 10% each day.

## **Esri E-Learning Courses**

Students will complete the following two Esri E-Learning courses. Certificates of the E-Learning courses should be submitted to Canvas. More instructions on the E-Learning courses will be provided in class.

1. Managing Lidar Data Using LAS Datasets (this course requires ArcGIS 10.6 or 10.7). (2 hours 30 min)
2. Managing Lidar Data Using Terrain Datasets. (4 hours 45 min)

## **Course Project**

Each student will complete an individual course project involving LiDAR data. Other remotely sensed or GIS data can be included if needed. Students should discuss project ideas with the instructor, identify a proper project topic, find LiDAR data for the project, and complete the project by the final week. The course project can be on LiDAR data processing and analysis methods, or any application of LiDAR. Each student will submit a course project report of 4 – 6 single-spaced pages (EXCLUDING tables, figures, and references). The course project report should be submitted to Canvas.

## Literature Review

Graduate students (including students in the Graduate GIS Certificate Program) will complete a literature review of LiDAR data analysis methods or applications in a specific field (such as vegetation mapping/measurement, land cover change detection, 3-D urban modeling, powerline corridor mapping, and landform analysis). Each student will submit a literature review of two single-spaced pages (EXCLUDING references), citing at least 10 references. The literature review should be submitted to Canvas.

## Schedule

Week	Dates	Topic
1	1/11 – 1/15	Course Introduction and Remote Sensing Overview <i>Demos and Handouts</i>
2	1/18 – 1/22	Review of Vector Data in GIS <i>Labs 1-4</i>
3	1/25 – 1/29	Review of Raster Data in GIS <i>Labs 5-8 and Project 2.1</i>
4	2/1 – 2/5	Principals of LiDAR <i>Project 2.2 and Project 2.3</i>
5	2/8 – 2/12	LiDAR Data Processing (1) <i>Project 3.1 and Esri E-Learning Course 1</i>
6	2/15 – 2/19	LiDAR Data Processing (2) <i>Project 3.2 and Esri E-Learning Course 1</i>
7	2/22 – 2/26	Free LiDAR Data Sources and Software <i>Handouts</i>
8	3/1 – 3/5	Vegetation Mapping and Measurement Using LiDAR (1) <i>Project 4.1 and Esri E-Learning Course 2</i>
9	3/8 – 3/12	Vegetation Mapping and Measurement Using LiDAR (2) <i>Project 4.2 and Esri E-Learning Course 2</i>
10	3/15 – 3/19	Urban Applications of LiDAR (1) <i>Project 5.1 and Esri E-Learning Course 2</i>
11	3/22 – 3/26	Urban Applications of LiDAR (2) <i>Project 5.2 and Esri E-Learning Course 2</i>
12	3/29 – 4/2	Measuring Tree Height and Building Height Using a Hypsometer <i>Handouts</i>
13	4/5 – 4/9	Earth Science Applications of LiDAR (1) <i>Project 6.1 and Course Project</i>
14	4/12 – 4/16	Earth Science Applications of LiDAR (2) <i>Project 6.2 and Course Project</i>
15	4/19 – 4/23	Course Project Week (work on your literature review and course project)
16	4/26 – 4/30	<b>Course Project Report Due</b>

## Grading Structure

Labs and In-Class Projects	33%
Two Esri E-Learning Courses (10% each)	20%
Course Project Report	30%
Literature Review	17%
<b>Total</b>	<b>100%</b>
90-100: A; 80-89: B; 70-79: C; 60-69: D; 0-59: F. A minimum grade of "B" is required for the GIS Certificate.	

### **Extra Credit**

The Department of Geography does not allow extra credit assignments (work not specified on a course syllabus).

### **Academic Dishonesty**

Students caught cheating or plagiarizing will receive a "0" for that particular assignment or exam. Additionally, the incident will be reported to the Office of Student Rights and Responsibilities for further penalty. According to the UNT catalog, the term "cheating" includes, but is not limited to:

- a. Use of any unauthorized assistance in taking quizzes, tests, or examinations;
- b. Dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments;
- c. The acquisition, without permission, of tests or other academic material belonging to a faculty or staff member of the university;
- d. Dual submission of a paper or project, or resubmission of a paper or project to a different class without express permission from the instructor(s); or
- e. Any other act designed to give a student an unfair advantage.

The term "plagiarism" includes, but is not limited to:

- a. The knowing or negligent use by paraphrase or direct quotation of the published or unpublished work of another person without full and clear acknowledgment; and
- b. The knowing or negligent unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

### **Accommodations**

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with an accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the Office of Disability Accommodation website at <http://www.unt.edu/oda>. You may also contact them by phone at 940.565.4323.

### **Classroom Courtesy**

Please follow these guidelines to avoid disrupting the class:

- (1) Turn off cell phones before arriving.
- (2) Do not arrive late or leave early (except for a bathroom break or emergency).
- (3) Do not sleep or eat during class.
- (4) Do not work on other assignments during class.
- (5) Do not talk when the instructor is lecturing, unless prompted for feedback by the instructor.

### **Course Evaluation**

You will receive an email with a link to the UNT Student Perceptions of Teaching (SPOT) Course Evaluation by the end of the semester.