GEOG 5525 – LiDAR Data Analysis in GIS (online asynchronous)
Fall 2022

Dr. Pinliang Dong
Professor, Department of Geography and the Environment
University of North Texas
E-mail: Pinliang.Dong@unt.edu   URL: http://geography.unt.edu/~pdong
Virtual office hours: Mondays, 1:30 – 2:30 pm, or by appointment.

Prerequisites: GEOG 3500/5510, or 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. Upon completion of this course, students should be able to: (1) create LAS datasets and Terrain datasets for LiDAR point clouds in ArcGIS; (2) generate three-dimensional views and profiles from LiDAR point clouds; (3) create digital surface models (DSM), digital terrain models (DTM), and digital height models (DHM) from LiDAR point clouds; and (4) extract three-dimensional (3D) building models from LiDAR data; (5) share digital building models in 3D Web Scenes; (6) describe applications of LiDAR data in a specific field; and (7) develop advanced 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 Pro Advanced (with 3D Analyst and Spatial Analyst extensions).

In-Class Exercises

A total of 4 labs and 10 hands-on projects will be graded. Step-by-step instructions for the projects are available in the textbook. Labs and hands-on projects should be submitted to Canvas. Late submission will be marked down 10% each day.

Esri Tutorials

Students will complete the following three Esri Academy tutorials. Certificates of the tutorials should be submitted to Canvas. More instructions on the tutorials will be provided in class.

1. Extract 3D Buildings from Lidar Data. (*1 hours 5 min*)
2. Create a Web Scene to Support Construction Planning (*45 min*)
3. Share Digital Building Models in 3D Web Scenes (*1 hour*)

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 5 – 8 single-spaced pages (EXCLUDING tables, figures, and references) to Canvas. The course project report should include at least 10 references. Turnitin will be used in Canvas for automatic plagiarism detection.

Grading Structure

Labs and In-Class Projects	40%
Three Esri Academy Tutorials (10% each)	30%
Course Project Report	30%
Total	**100%**
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).

Schedule

Week	Topic
1	Course Introduction and Remote Sensing Overview *Labs 1-2*
2	Review of GIS Basics and Raster Data *Labs 3-4*
3	Principles of LiDAR *Project 2.1 & Project 2.2*
4	LiDAR Data Processing (1) *Project 3.1*
5	LiDAR Data Processing (2) *Project 3.2*
6	Starting Your Course Project *Esri Tutorial: Extract 3D Buildings from Lidar Data*
7	Vegetation Mapping and Measurement Using LiDAR (1) *Project 4.1*
8	Vegetation Mapping and Measurement Using LiDAR (2) *Project 4.2*
9	Urban Applications of LiDAR (1) *Project 5.1 & Esri Tutorial: Create a Web Scene to Support Construction Planning*
10	Urban Applications of LiDAR (2) *Project 5.2 & Esri Tutorial: Share Digital Building Models in 3D Web Scenes*
11	Measuring Tree Height and Building Height Using a Hypsometer *Handouts*
12	Earth Science Applications of LiDAR (1) *Project 6.1 and Course Project*
13	Earth Science Applications of LiDAR (2) *Project 6.2 and Course Project*
14	Course Project Week (work on your course project)
15	Course Project Week (work on your course project)
16	**Course Project Report Due**

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.

Rules of Engagement

Rules of engagement refer to the way students are expected to interact with each other and with their instructors. Here are some general guidelines:

- While the freedom to express yourself is a fundamental human right, any communication that utilizes cruel and derogatory language on the basis of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law will not be tolerated.

- Treat your instructor and classmates with respect in any communication online or face-to-face, even when their opinion differs from your own.
- Ask for and use the correct name and pronouns for your instructor and classmates.
- Speak from personal experiences. Use "I" statements to share thoughts and feelings. Try not to speak on behalf of groups or other individual's experiences.
- Use your critical thinking skills to challenge other people's ideas, instead of attacking individuals.
- Avoid using all caps while communicating digitally. This may be interpreted as "YELLING!"
- Be cautious when using humor or sarcasm in emails or discussion posts as tone can be difficult to interpret digitally.
- Avoid using "text-talk" unless explicitly permitted by your instructor.
- Proofread and fact-check your sources.
- Keep in mind that online posts can be permanent, so think first before you type.

See these Engagement Guidelines (https://clear.unt.edu/online-communication-tips) for more information.

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.