Assignment 11-1: Prepare 3D building and topography features for a 3D study (100 points)

3D GIS is an essential tool for managing campuses for many organizations including universities, hospitals, office parks, shopping centers, and others who have buildings and land parcels to manage. Having 3D campuses are important for owners and operators who need planning and maintenance tools to serve students, customers, and shoppers using outdoor and indoor spaces. Security, safety, staffing, networking, ADA (Americans with Disabilities Act) compliance, and utility management are just a few reasons to use GIS to create 3D campuses. In this assignment, you prepare a local scene for use in a 3D campus study for two of Pittsburgh's largest academic campuses of Carnegie Mellon University and the University of Pittsburgh.

Get set up

Rename the Assignment11-1 folder to **Assignment11-1YourName** and open Assignment11-1.aprx. Its map has the following data in a 2D map:

- **Buildings3D_Pitt** — polygon features of University of Pittsburgh buildings, including an existing building height field *that has already been derived* from Lidar data
- **Buildings2D_CMU**— polygon features of Carnegie Mellon University buildings, *used to create* a building height field derived from Lidar data
- **Topo**—polyline topography contour features of the campus study area
- **StreetCurbs**—2D polyline layer of street curbs
- **Parks**—2D polygon layer of parks

Build a TIN surface

Create a TIN surface called **CAMPUS_TIN** from the contours polylines using the same coordinate system as the contours layer.

Create 3D buildings from Lidar data

- Using LAS files found in Assignment11-1\Data\LASFiles, create a LAS dataset called **Assignment11-1_LASDataset**. These are for the CMU campus buildings only. The University of Pittsburgh's buildings already have a 3D height field.

Create DSM (digital surface model) using first return LAS points, DTM (digital terrain model) using ground LAS points, and nDSM (normalized digital surface model). Use a cell size of 5 feet for all rasters and correct settings for each raster type (for example, Binning interpolation for DSM and Triangulation for DTM).

- Create random points for Buildings2D_CMU with 100 points and a minimum allowed distance of 5 feet.
- Apply the nDSM surface to the buildings, and use summary statistics to generate a Z value (height) for the buildings.
- Join the summary statistics to the Bldgs features and create a field called **Height** that is calculated from the statistics table Z field. Remove the summary statistics join and export a feature class called **Buildings3D_CMU** to your assignment's file geodatabase. HINT: See pages 135-136 of chapter 4 for instructions on adding and calculating fields.
- Add Buildings3D_CMU to your map, and remove Buildings2D_CMU from the Contents pane.

Create a local scene

- Convert the map to a scene and make it a local 3D scene called **CampusStudy_3D** using Campus_TIN as the current surface, displaying it as a slope, simple feature using a neutral color.
- Clip the layers to the extent of the Campus_TIN layer and change the scene's coordinate system to NAD 1983 State Plane PA South.
- Remove the existing ArcGIS Online service 3D Terrain surface and all 2D layers except StreetCurbs, Parks, and Campus_TIN.
- Display the Buildings3D_CMU as 3D features using the Height field.

Edit a building's height

- The University of Pittsburgh's Cathedral of Learning building height is incorrect in the attribute table (250 feet). Using Lidar points, scale the building to its correct height or edit the Buildings3D_Pitt building attribute table to correct the height to its actual height of 535 feet.

Create bookmarks

Create three bookmarks:

- **Pitt campus**—view from Pitt's campus to CMU's campus buildings to the east
- **CMU campus**—view from CMU's campus to Pitt's campus buildings to the west
- **Cathedral of Learning**—3D zoomed view of one of the tallest academic buildings in the world.

What to turn in

Compress and upload your Assignment11-1YourName folder as a .ZIP file to Canvas under Assignment11 > Submit Assignment.