

Touch Terrain Project

- 3D maps for teaching (K-12, university, museums, planners)
- Select terrain area, download STL file(s), print 3D terrain model
- Small printer? Split area in tiles (2x2, 4x3, etc.), print each tile, glue tiles together
- **Web app** and **Standalone version** (Python Jupyter notebook, also as Docker container)
- Uses elevation data set via Google Earth Engine (USGS NED 10m, NASA SRTM 30m, etc.)
- TouchTerrain.geol.iastate.edu, TouchTerrain.org or just google Touchterrain

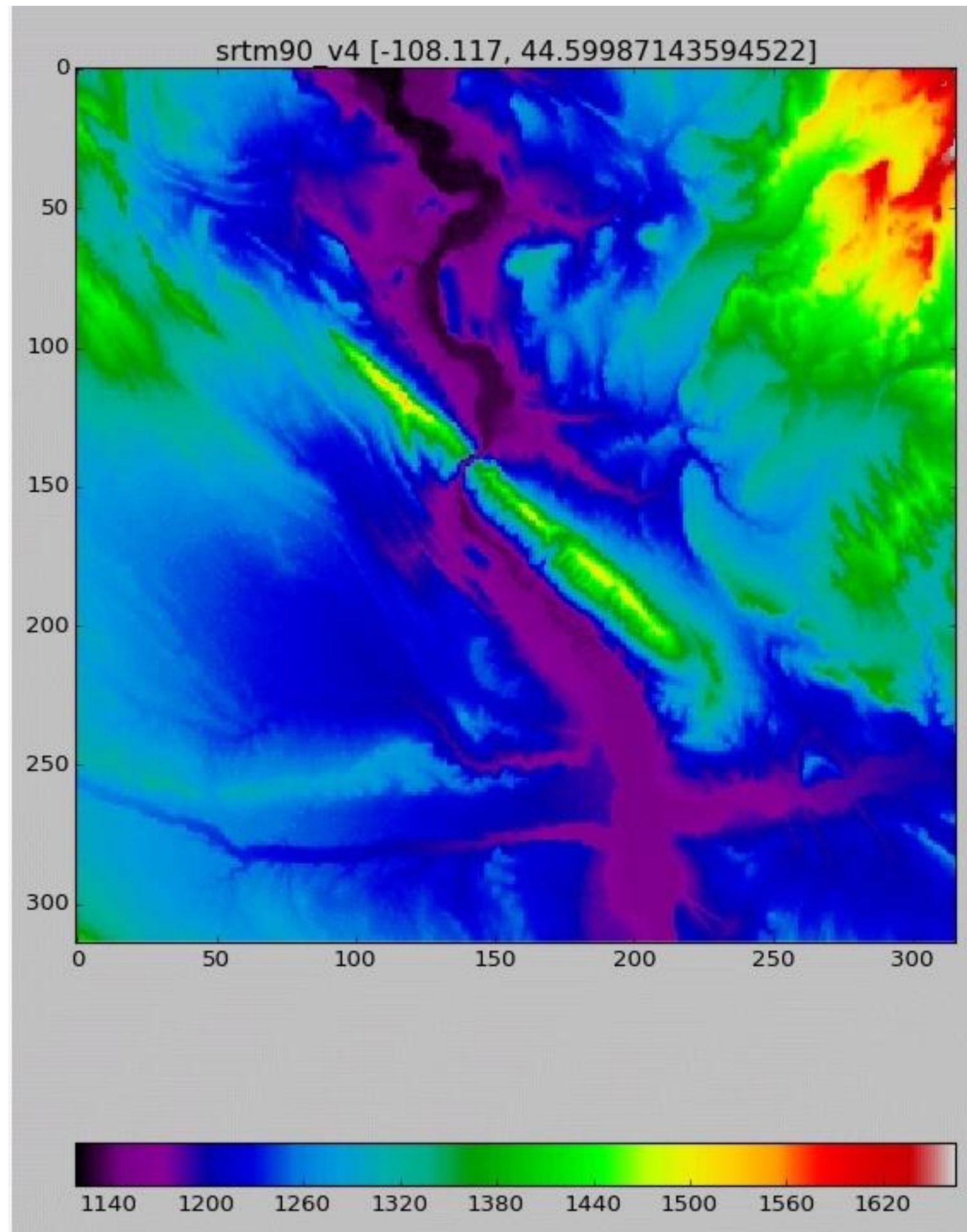
Why to (not) use 3D printed terrain models

- “Visualizes” 3D terrain, more effective (?) than 2D contour maps
- Super intuitive to navigate (zoom, rotate, pan)
- Can be touched (visually impaired) and annotated (pen, paint)
- no tech needed for the end user, all tech is done in the production of the model
- Easy to create 3D model (STL) files with TouchTerrain
- 3D printed models are cheap and sturdy (field work use)
- But:
 - Need access to a 3D printer (maybe learn how to use it)
 - Static: not as flexible as 3D computer graphics
 - Tricky to superimpose other data (roads, faults, etc.)

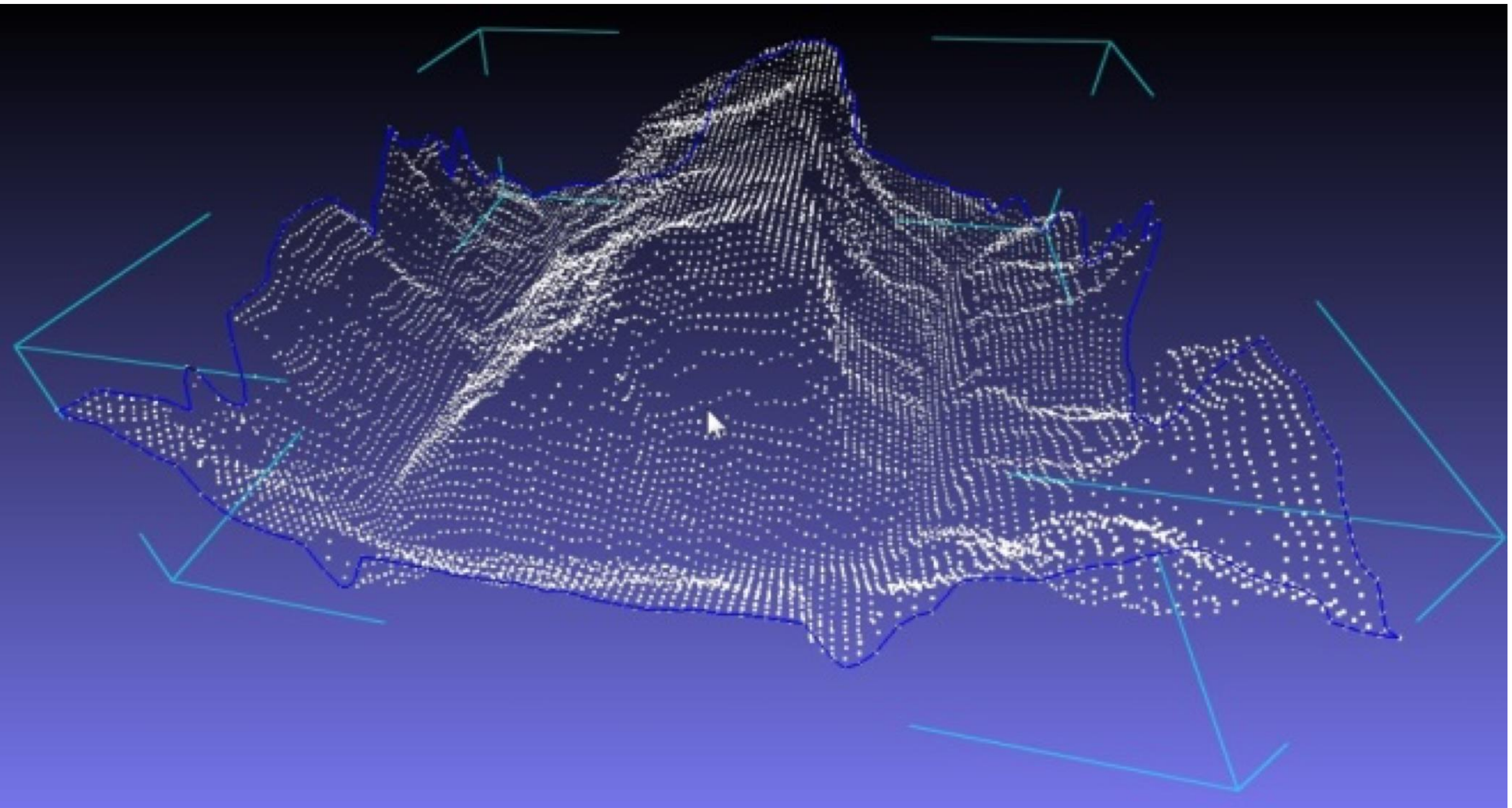
3D model file creation

- Need a Digital Elevation Model (DEM)
- Raster (image) that stores elevation values

80	74	62	45	45	34	39	56
80	74	74	62	45	34	39	56
74	74	62	62	45	34	39	39
62	62	45	45	34	34	34	39
45	45	45	34	34	30	34	39

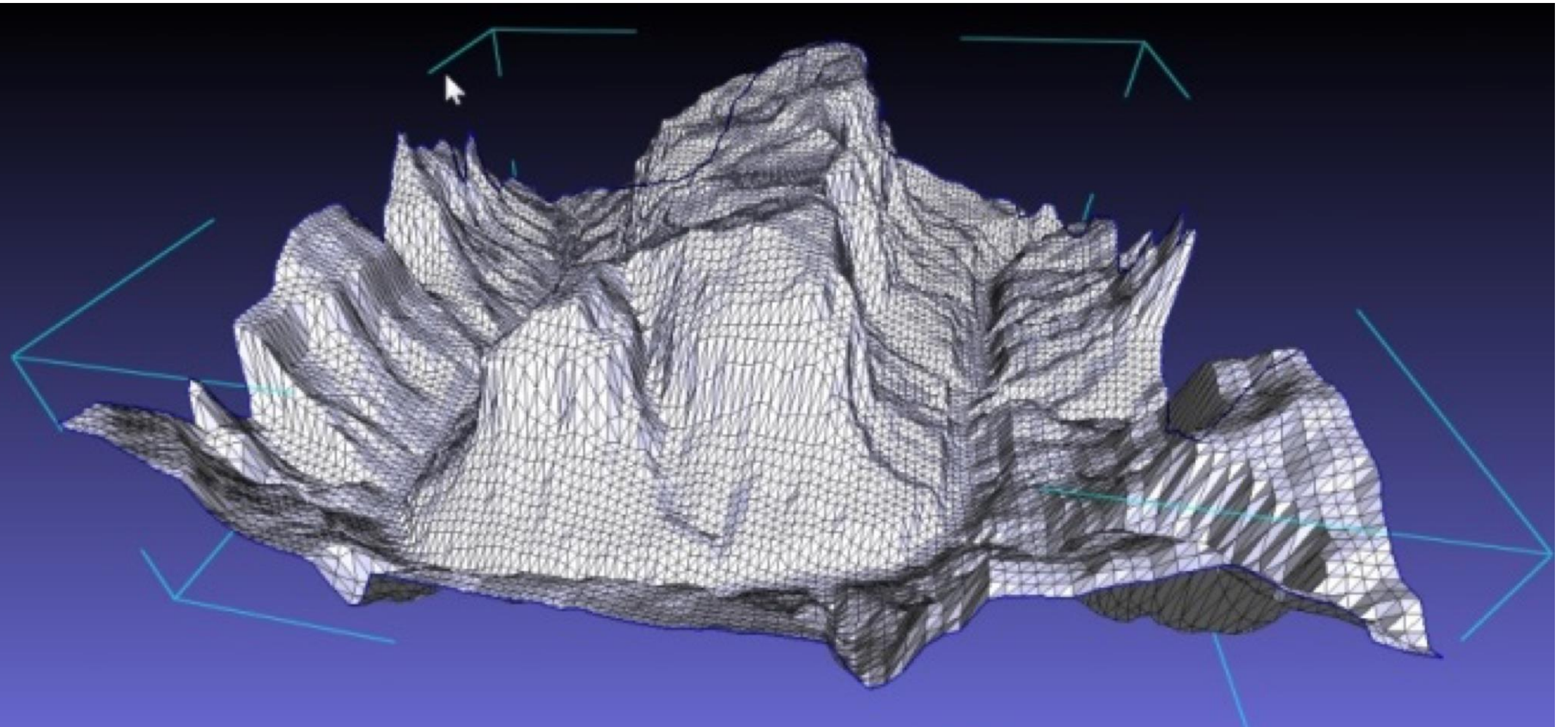


2D elevation raster data to 3D point cloud

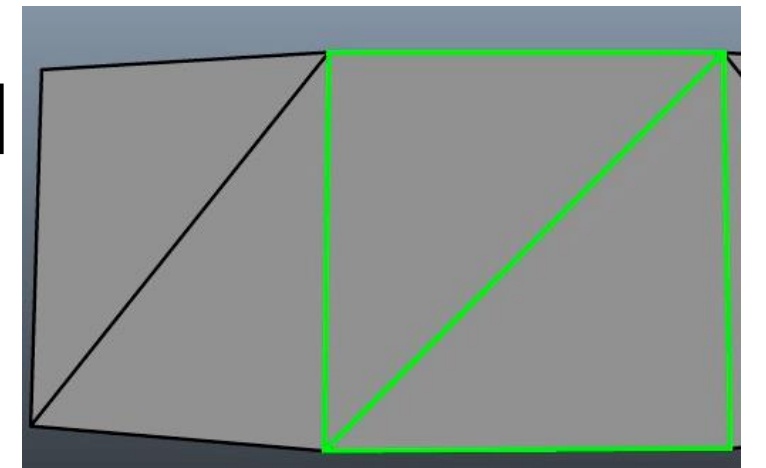


- Elevation raster \Rightarrow 3D point at each pixel/cell center
- Result: 3D point cloud, regular at x/y steps

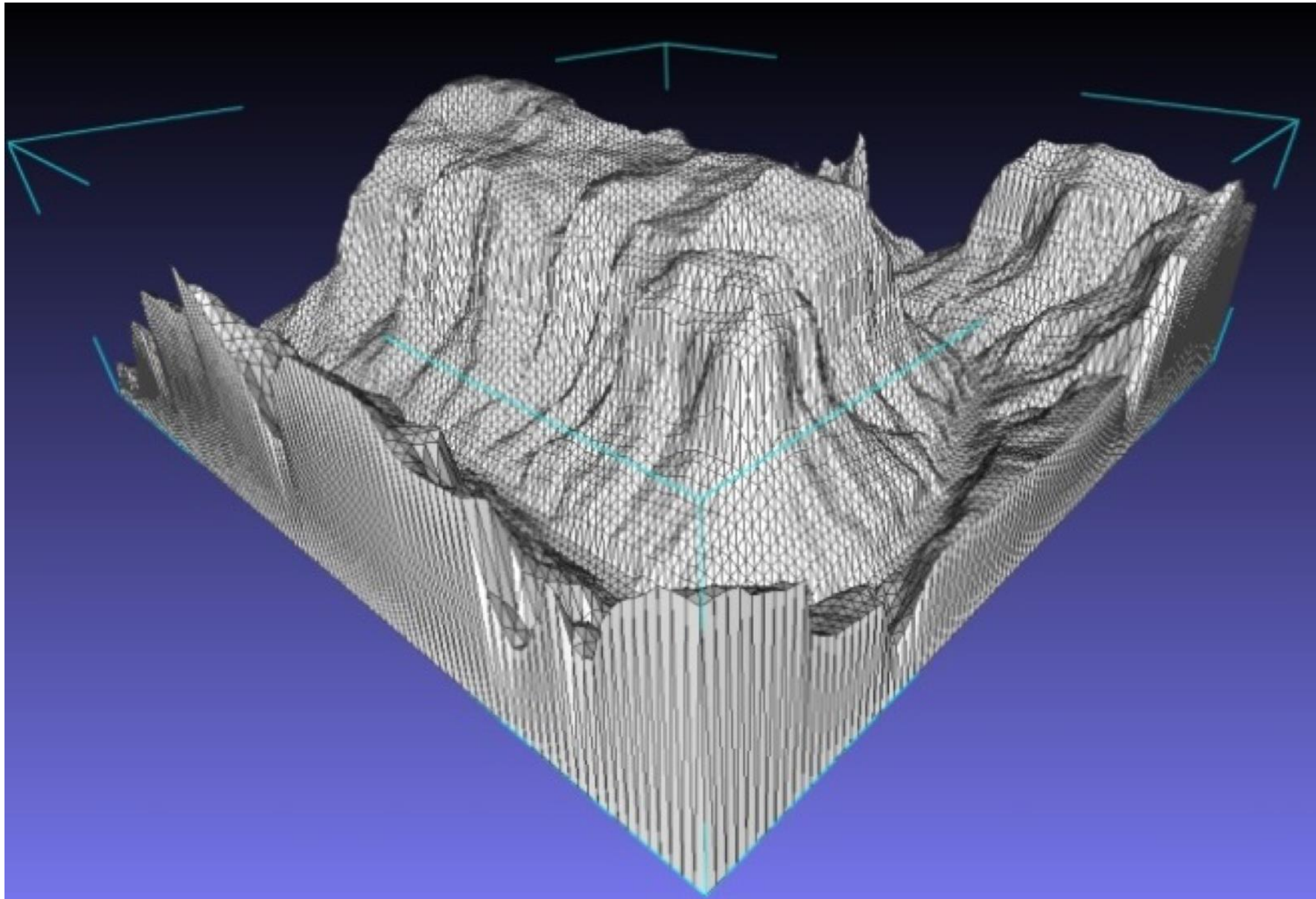
Connect point cloud into a triangle mesh



- Connect four “corner points” into a quad
- Split each quad into two triangles
- Creates a triangle mesh (top only)



Add sides, bottom -> boundary representation model



- Add triangles for four walls + bottom
- write as STL file (no color, no texture, no material)

TouchTerrain Web app demo

please follow along and interrupt if you
have questions

<https://touchterrain.geol.iastate.edu>

Or

touchterrain.org

Walk through steps

1. Select the area to print (navigation, search)
2. Optional: configure hill shading
3. Configure 3D printer parameters (special focus on z-scaling)
4. Create model file and preview it
5. If time: command line tricks (remove or lower some terrain)