Elevation Data

**Elevation data processing**
- High-resolution maps from multiple sources are processed and combined
- Triangulated and optimized for use in interactive visualization
- Used as both mesh and scalar data during street and building generation
- Textured with various 2D maps:
  - High-resolution aerial and satellite photographs
  - Information maps - streets, traffic, topography, weather, etc.
  - Elevation maps with atlas and relief shaders

**Sources of elevation data**

- Elevation data from the USGS
  - 10m resolution for parts of U.S.
- Detailed Contour Maps resampled to 2m resolution

**Gigapixel textures geolocated with the elevation map**

- Realistic aerial photograph
- Synthesized ground texture

**3D Models**

- **Terrain Model**
  - 10m and 2m elevation maps combined in 3.5m map
  - Triangulated into optimized 3D mesh
  - Texture mapped with gigapixel aerial photograph

- **Street Models**
  - 3D models exported from ESRI CityEngine
  - Geometry instancing used for all repeating objects
  - Generated RoadXML description for use in the OKTAL SCANeR driving simulation software

- **Building Models**
  - GIS procedural buildings exported as 3D models from ESRI CityEngine
  - LIDAR buildings used as backdrop

- **Final Result**
  - All models combined in scenes with different levels of detail, lighting, cameras, sky, etc.
  - Converted to OpenSceneGraph and NVIDIA SceniX for realtime visualization and validation
  - For use in the Immersive Cabin, the Reality Deck and InnoSim car simulators

**Interactive Visualization / Validation**

- Caton Ave. near Prospect Park Parade Ground
- E. Broadway and Forsyth Street

- JFK and Manhattan tracks, LIDAR buildings, gigapixel terrain

**Procedural 3D Modeling in ESRI CityEngine**

**Street generation from NYC OpenData GIS**

- LOD0: Simple model
- LOD1: People and clutter
- LOD2: More models and traffic

**Building generation with land lot data only**

- LOD0: Simple procedural facades
- LOD1: Complex procedural facades

**GIS procedural buildings**
- Realistic building outlines and heights
- Photo-based synthesized building facades

**LIDAR buildings**
- Realistic but low resolution
  - Suitable for background, not driving