Creating a Simulated Lunar Terrain for Computer Vision Research in Omniverse
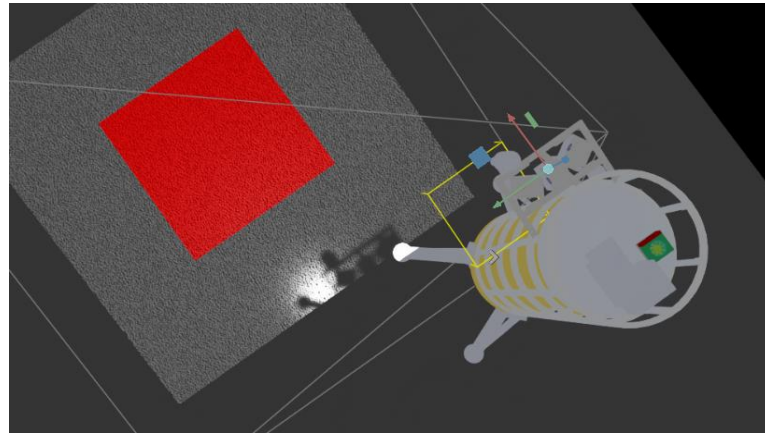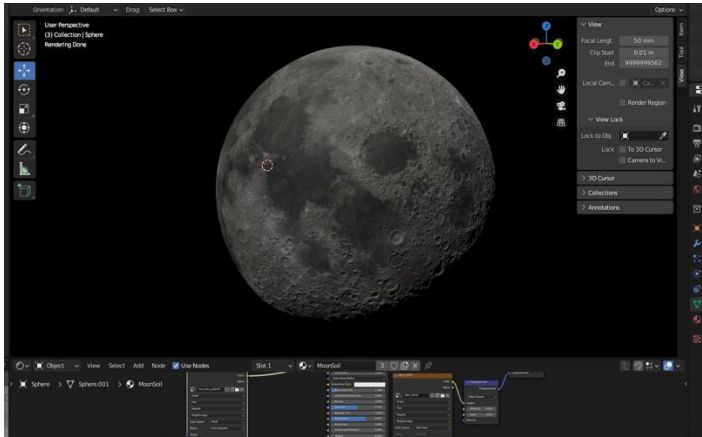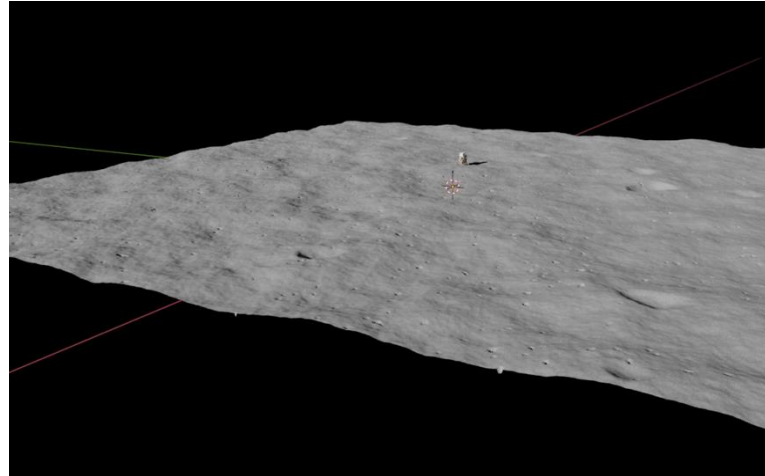
Bronco Space

California State Polytechnic University, Pomona

For Public Release

August 8, 2024

# Nasa TechLeap: Precision Landing Challenge

- Bronco Space leading student space organization in space technologies at Cal Poly Pomona.
- Demonstrate sensor systems comprised of LiDAR, Structured Light, and Machine Learning to generate a three-dimensional map during a rocket-powered landing on the lunar surface.

Omniverse Simulation

- Randomized Lunar Terrain generation with large (craters, hills) and small (mini craters, rocks) artifacts.
- Additional terrain samples are hand-crafted or scaled NASA High Resolution Topography.
- Many customizable parameters to set crater and terrain size and characteristics.
- Large area for training data collection, enabling for a wider range of unique data.

Omniverse Data Generation
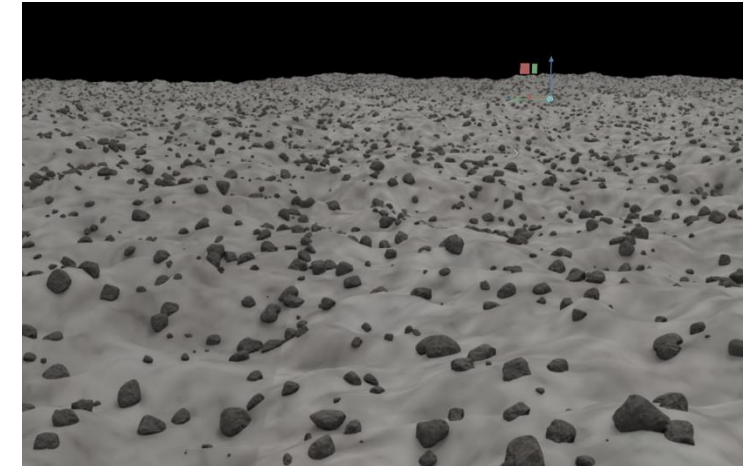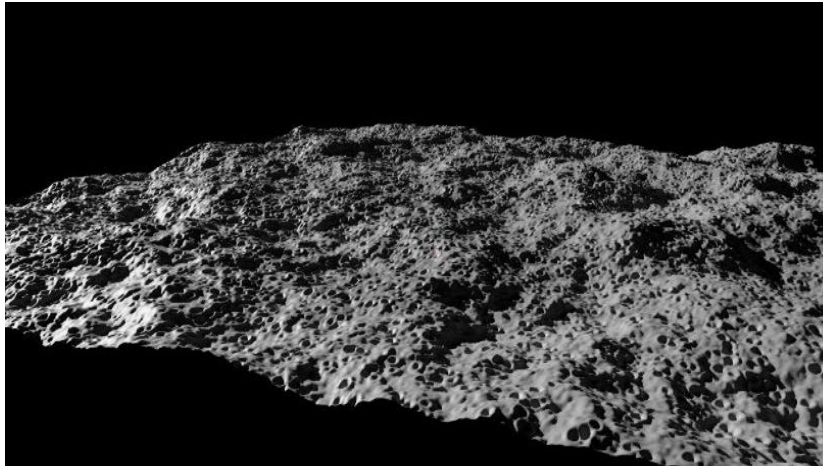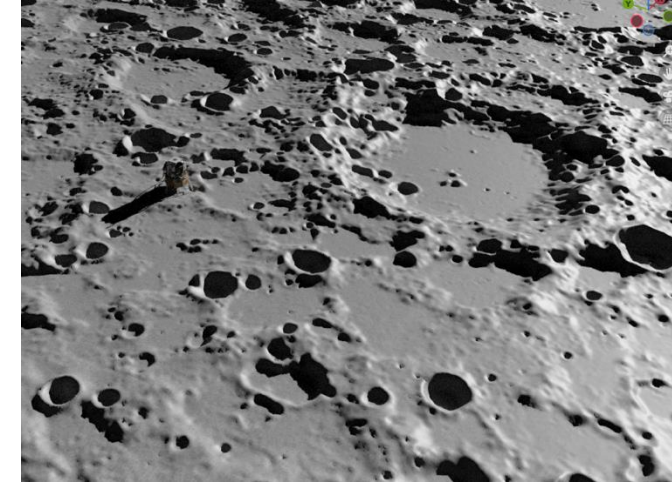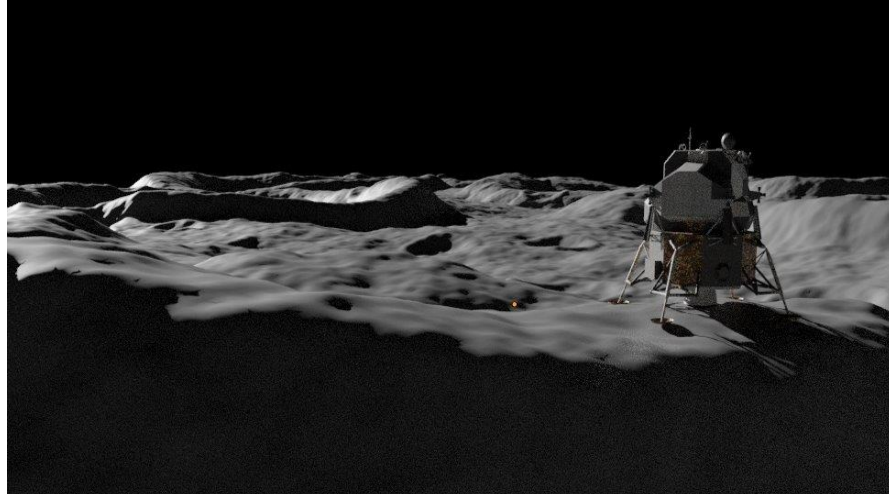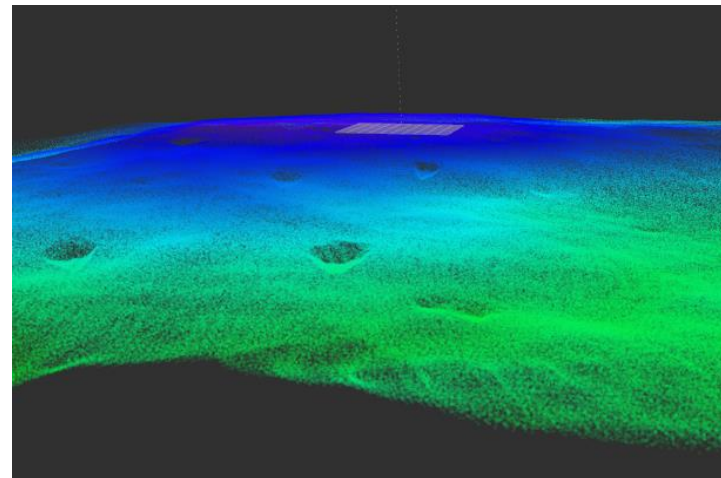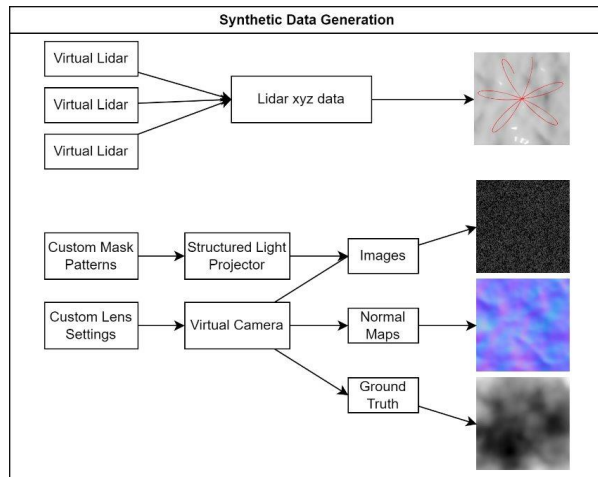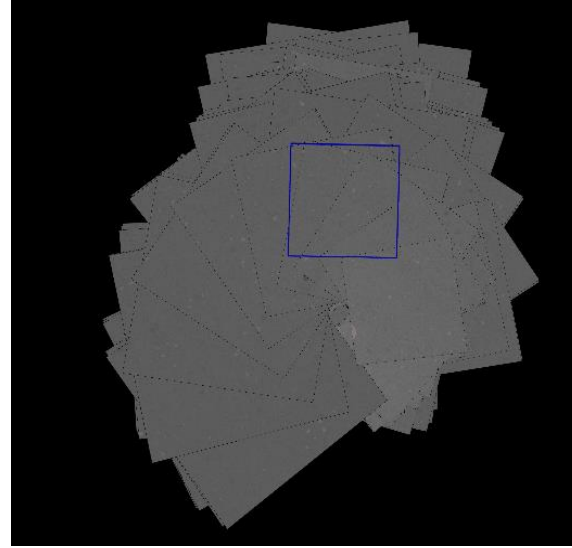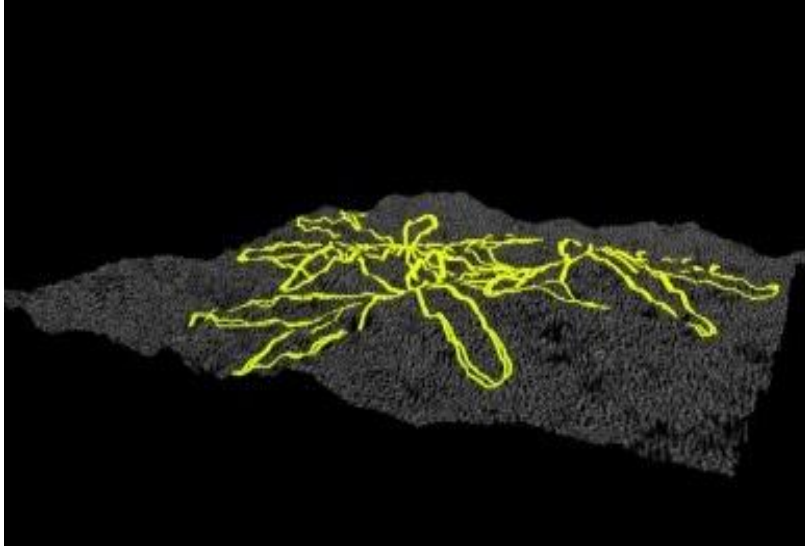
- Omniverse generates thousands of synthetic training data including LiDAR depth and Camera Imaging.
- Simulate numerous landing scenarios and update physical model to optimize performance.
- Train machine learning model with many different terrain challenges.
- Merge LiDAR and Camera imagery and compare generated DEMs with model simulation.

Lessons Learned and Next Steps

- Adapting Omniverse Simulation environments for other generalized space missions.
- Enhanced techniques for terrain generation and developing simulation environments.
- Improving and validating accuracy of simulation environments to real world conditions.
- Additional capabilities in Wildfire Detection and Spacecraft Monitoring.