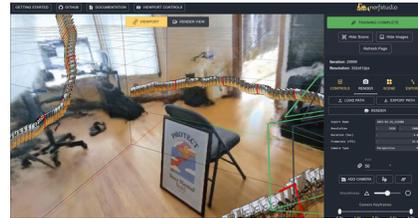


# Boston in 3D: A Citywide Object Archive Using Nerfstudio

John Yechan Jo, Qiwen Xiao, Wenbo An

## Introduction

**Boston in 3D** is an initiative that captures and reconstructs objects across Boston, transforming them into detailed 3D models for interactive exploration. By leveraging Nerfstudio's neural radiance field (NeRF) technology, the project showcases a wide variety of city artifacts—including street sculptures, architectural details, and everyday items—within a user-friendly map interface. Scans are obtained via PolyCam, processed with Nerfstudio, and then visualized using Three.js and Leaflet, enabling immersive real-time navigation and routing around Boston's urban landscape.



## Scene Rendering

**Three.js** is employed to load and render the 3D models in a browser-based environment.

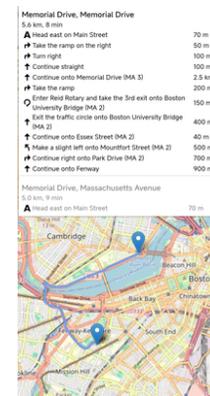
HDMI maps from **Poly Haven** are added to create realistic lighting and reflections within the 3D scene.



## Map Integration

The interactive map is built using **OpenStreetMap** data and **Leaflet**.

**Leaflet Routing Machine** provides navigation functionality, allowing users to generate routes and directions to each 3D object's location.



The final site is deployed on **Vercel**.

Visit: <https://nvidia-mit.vercel.app/>

## Quality Assurance

In our workflow, we have included a step for automatic quality assessment of the models. We report the following metrics for each model.

Example: *different-chairs*.

Metric	Value	Ideal
Polygon Composition	Triangles: 54156, Quads: 0, Ngons: 0	-
Vertex Count	35330	-
Face Count	54156	-
Edge Count	89099	-
Is Watertight	False	True
Bounding Box Size	[1.049674, 2.28574, 7.15594]	-
UV Coverage	0.996948139885	1
UV Overlap Count	307348	0
Aspect Ratio (Avg)	1.7119014983714047	-
Aspect Ratio (Min)	1.001092911616002	-
Aspect Ratio (Max)	567.1252187939361	-
Normal Consistency Score	99.88551591698057	100

## Future Work

Add **more objects**, especially historical landmarks and large buildings, to the map.

Improve the user interface and add more **interactive features**.

Allow users to **upload** their own 3D models and display them on the map

Direct integration with **Nerfstudio** for real-time model generation

## Conclusion

**Boston in 3D** leverages NeRF-based reconstruction (Nerfstudio) and PolyCam scanning to create a dynamic, interactive archive of the city's objects. This immersive platform fosters broader engagement with local environments and supports continued growth for applications in preservation, education, and collaborative sharing.



## Reference

- [1] Mildenhall, B., Srinivasan, P. P., Tancik, M., Barron, J. T., Ramamoorthi, R., & Ng, R. (2020). NeRF: Representing scenes as neural radiance fields for view synthesis. *European Conference on Computer Vision (ECCV)*, 405–421. Springer.
- [2] Martin-Brualla, R., Radwan, N., Sajjadi, M. S. M., Barron, J. T., Dosovitskiy, A., & Duckworth, D. (2021). NeRF in the Wild: Neural Radiance Fields for Unconstrained Photo Collections. *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021, 7210–7219.