# Generation of 3D point cloud from single view RGB Image/panorama

Computer Vision (CS6350) TPA - 10

## 1. Problem Statement

The problem introduces the task of generating point cloud using single view RGB image or panorama [Depth map or any other depth information should not be provided as input]. Point clouds are a collection of points that represent a 3D shape or feature. Each point has its own set of X, Y and Z coordinates and in some cases additional attributes like colour, class labels.

## 2. Input

Single view RGB Image or panorama.

## 3. Output

- Point cloud
- Quantitative evaluation metric Chamfer distance and earth mover's distance (EMD) [1]
- Demo to run on a given image (Working demo of code to be shown on Desktop/Laptop with GPU (preferable for extra credit)).

## 4. Dataset

- ShapeNet [5]: This dataset is a richly-annotated, large-scale repository of shapes represented by 3D CAD models of objects. ShapeNet has indexed more than 3,000,000 models, 220,000 models out of which are classified into 3,135 categories.
- Pix3D [6]: Pix3D is a large-scale benchmark of diverse image-shape pairs with pixel-level 2D-3D alignment. Pix3D has 395 3D shapes of nine object categories. Each shape associates with a set of real images, capturing the exact object in diverse environments. 10,069 image-shape pairs have precise 3D annotations, giving pixel-level alignment between shapes and their silhouettes in the images.

## 5. References

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- 3. Mandikal, Priyanka, and Venkatesh Babu Radhakrishnan. "Dense 3d point cloud reconstruction using a deep pyramid network." 2019 IEEE Winter Conference on Applications of Computer Vision (WACV). IEEE, 2019.
- 4. Mandikal, Priyanka, et al. "3D-LMNet: Latent embedding matching for accurate and diverse 3D point cloud reconstruction from a single image." arXiv preprint arXiv:1807.07796 (2018).
- 5. Chang, Angel X., et al. "Shapenet: An information-rich 3d model repository." arXiv preprint arXiv:1512.03012 (2015).
- 6. Sun, Xingyuan, et al. "Pix3d: Dataset and methods for single-image 3d shape modeling." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 2018.