**Reaction Report**

In last few years 3D point cloud segmentation, classification and semantic scene segmentation has grabbed a lot of attention due to its nature which differ to typical grid structure used for deep learning convolutional neural networks. There have been many solutions proposed to solve this problem but true pioneer to the solution of processing 3D points cloud instead of transforming those into 2D images or voxel grids is PointNet. It has proposed a methodology to process 3D point to extract local and global features and classify objects, perform part and scene segmentation. There were few major problems with the proposed architecture of PointNet such as it doesn’t deal with partitioning of point set and abstracting the set points or local features by local feature learners.

Methodology proposed by Charles R. Qi, Li Yi, Hao Su, Leonidas J. Guibas from Stanford in PointNet++: Deep Hierarchical Feature Learning on Point Sets in a Metric Space solves these issues by hierarchal point set feature learning. This methodology proposed to partition the point cloud using farthest point sampling in metric space which helps to deal the different density level in point cloud using hierarchical approach variations of multi-scale grouping or multi resolution grouping. Grouping layer than searches for neighboring points around centroids and last step of set abstraction level is use of point net to translate local region patters using grouping output into feature vectors. Use the output points for fully connected layer which performs classification.

On the other hand we can use the point feature propagation to original points for the segmentation task. Experiment was performed on indoor and outdoor dataset for segmentation and classification and it performed better than previous state of art solution. They observed results using both available grouping options which shows multi resolution grouping is better option for some cases as compare to other and has less computation cost.

In my opinion PointNet++ is an interesting modification to solve the local feature learner problem as well partitioning of point cloud. It has provided one of the most interesting solution for density invariant system by using hierarchical approach which can be done across scales and resolution. This has helped in grouping on different levels. As far as segmentation is concerned it’s not clear if they can process large and complex scenes and identify scene semantic. Basic learning network for PointNet++ can deal upto 1k point approximately though it requires larger and flexible network to accommodate LIDAR point data which is much greater. It has one of the biggest limitation of scaling up for 3d feature learning and magnitude to cover more points. It has been very unclear how it is going to identify or classify the objects or part of scenes meanwhile predicting semantic label for point cloud seems like major accomplishment from the architecture. In terms of contextual background it is segmenting large point cloud using sliding window which limits the contextual information only with small area.