Legend:

GSS	Gumbel softmax sampling
IDS	Inverse density sampling
1× 1 Conv	1× 1 Convolution
US	Up-Sampling
Global Feature Extraction	Non-local global attentive module
Loss	Cross Entropy loss of side outputs and fused output

Original Residual Learning Block (RLB Inefficient Implementation)

Residual Learning Block 1 (RLB1 when $D_{in} \neq D_{out}$)

Residual Learning Block 2 (RLB2 when $D_{in} = D_{out}$)

(a) *RLB Design*

Point Clouds Multi-Resolution Encoder

Point Clouds Multi-Resolution Decoder

$F^{out} = M^{in}: \frac{N}{625} \times 256$

$M^{out}: \frac{N}{625} \times 256$

Classification Predictions

Contextual Loss

car, bicycle, motorcycle, other vehicles, other ground, traffic sign, bicyclist, road, parking, sidewalk, truck, buildings, fence, vegetation, trunk, terrain, person...

Scale 5 Scale 4 Scale 3 Scale 2 Scale 1

Multi-Layer Fusion

Segmentation Predictions

(b) *FG-Net*