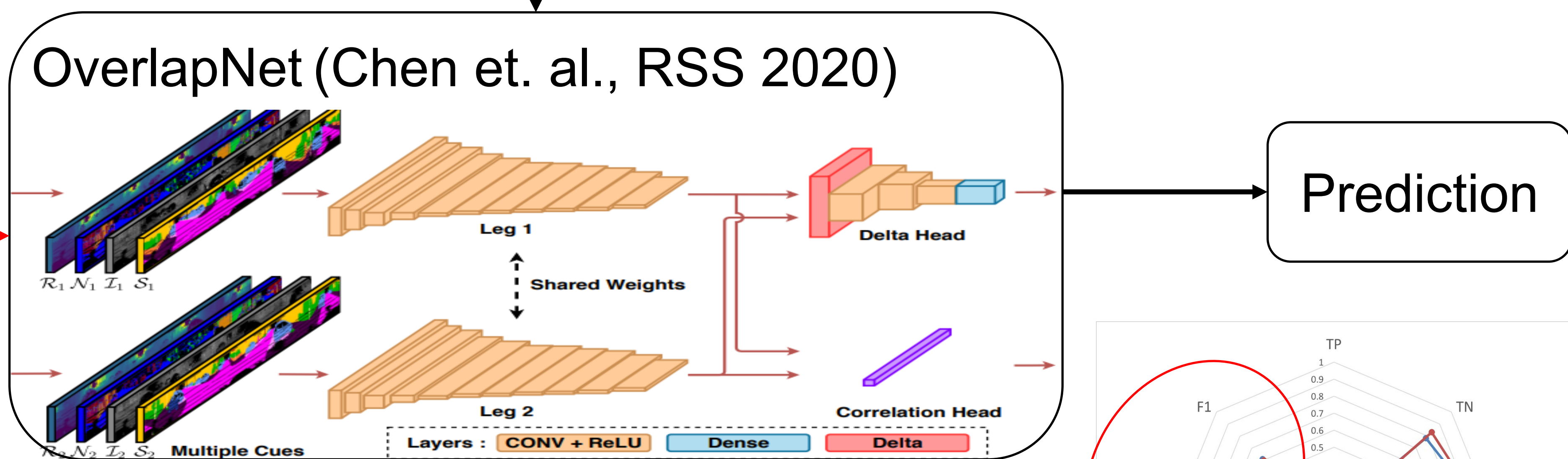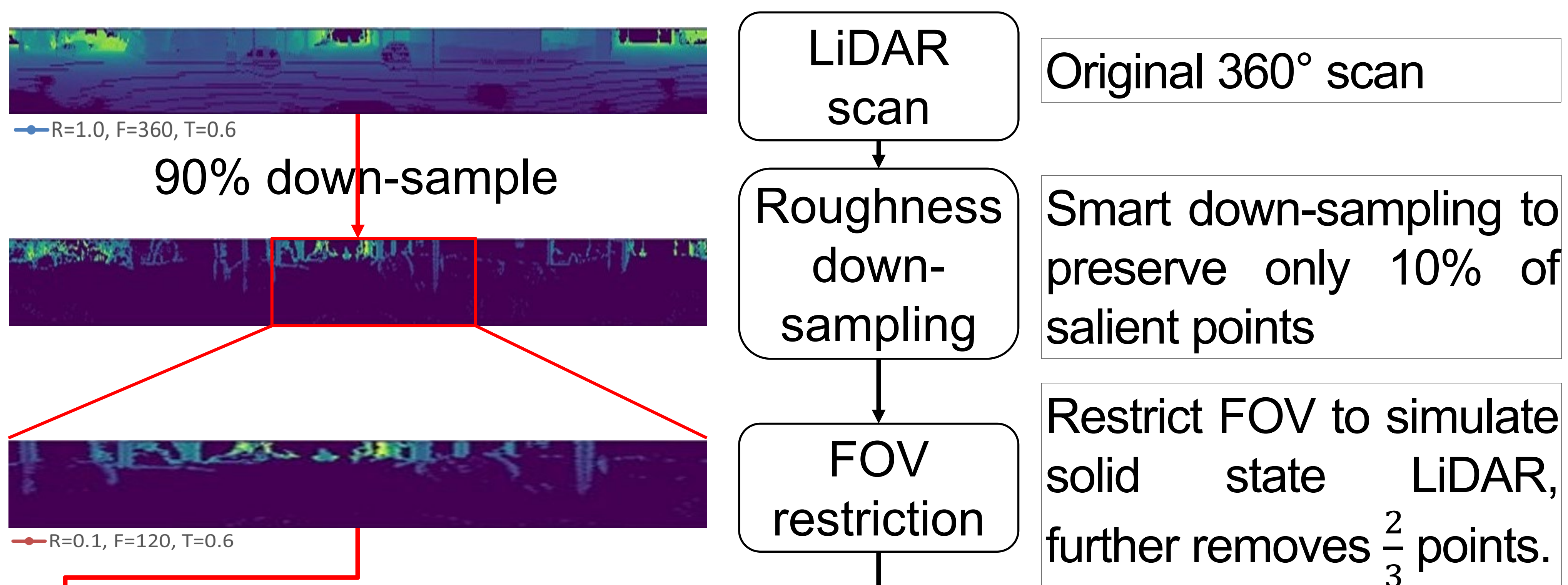# LiDAR Relocalization on edge devices

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Project Objectives:

To explore the possibility of adapting an existing LiDAR relocalization method on edge devices with limited computational resources and field-of-view restriction while minimizing performance loss. A novel point cloud down-sampling technique and a novel method to calculate overlapping area of two circular sectors are developed in order to achieve this objective.

R=1.0, F=360, T=0.6

90% down-sample

R=0.1, F=120, T=0.6

LiDAR scan	Original 360° scan

↓

Roughness down-sampling	Smart down-sampling to preserve only 10% of salient points

↓

FOV restriction	Restrict FOV to simulate solid state LiDAR, further removes $\frac{2}{3}$ points.

OverlapNet (Chen et. al., RSS 2020)

$\mathcal{R}_1\ \mathcal{N}_1\ \mathcal{I}_1\ \mathcal{S}_1$

Leg 1

Shared Weights

Leg 2 $\mathcal{R}_2\ \mathcal{N}_2\ \mathcal{I}_2\ \mathcal{S}_2$ Multiple Cues

Delta Head

Correlation Head

Layers : CONV + ReLU   Dense   Delta

Prediction

With only approximately 3.3% of points remaining compared to the original LiDAR scan, F1-score only dipped by 1.8%, and accuracy even increased by 3.3%.

R=1.0, F=360, T=0.6   R=0.1, F=120, T=0.6