URBAN ROBOTICS LAB

ICRA 2019

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Joohyun Park

Thursday, May 30th, 2019

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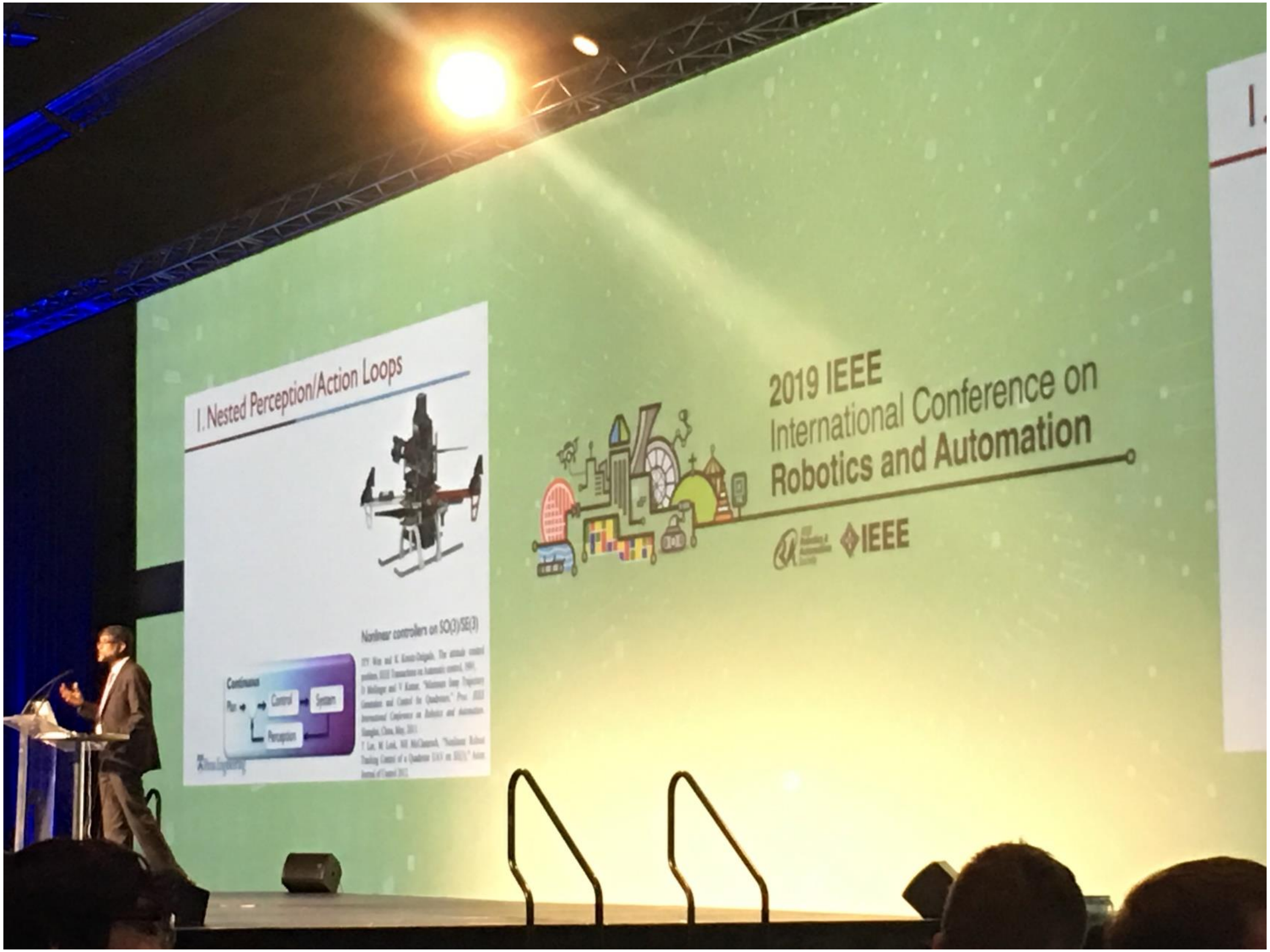
ICRA Opening & Plenary Talks

ICRA Keynote Talks



Impressive Research

1-Day Learning, 1-Year Localization: Long-term LiDAR Localization using Scan Context Image

Giseop Kim, Byungjae Park and Ayoung Kim,
IEEE Robotics and Automation Letters (RA-L) (with ICRA), 2019.

Introduction

- What is goal of this paper?
  - A robust year-round localization performance even when learned in just a single day.

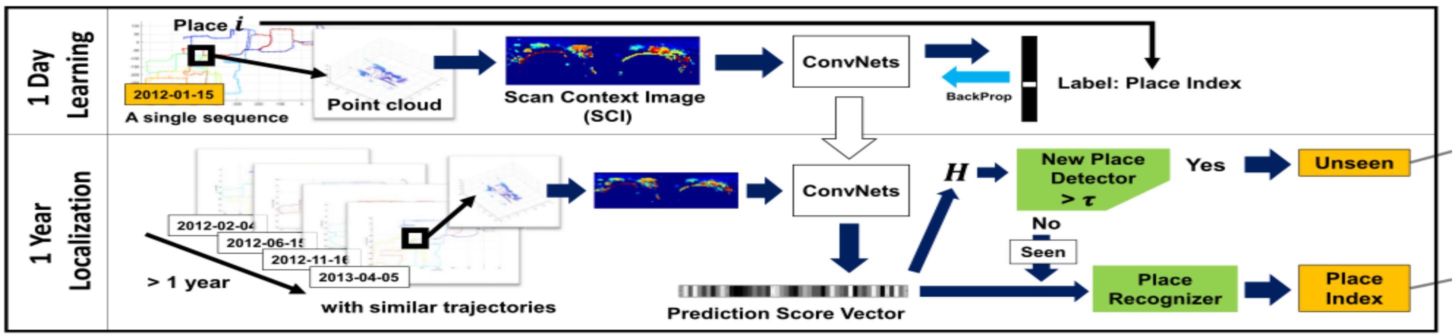
- Contributions
  - They introduce the classification-based place retrieval pipeline using an image-shaped point cloud descriptor called SCI (Scan Context Image).

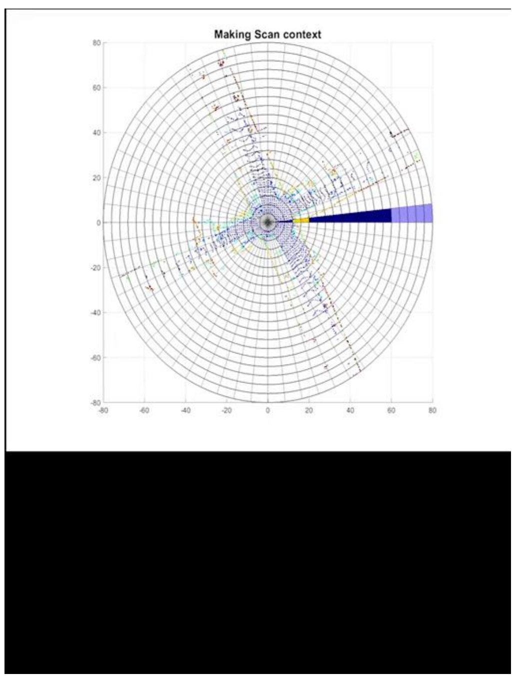
  - To alleviate false alarms during long-term localization, they propose an entropy-based detection module for unseen places.

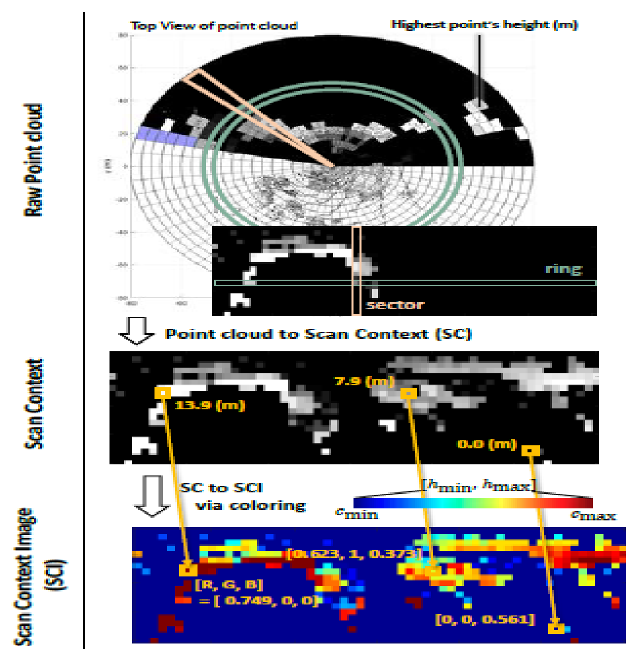
1-Day Learning, 1-Year Localization: Long-term LiDAR Localization using Scan Context Image

- Train a novel point cloud descriptor, Scan Context Image (SCI), using a classification network.

SCI localization Framework







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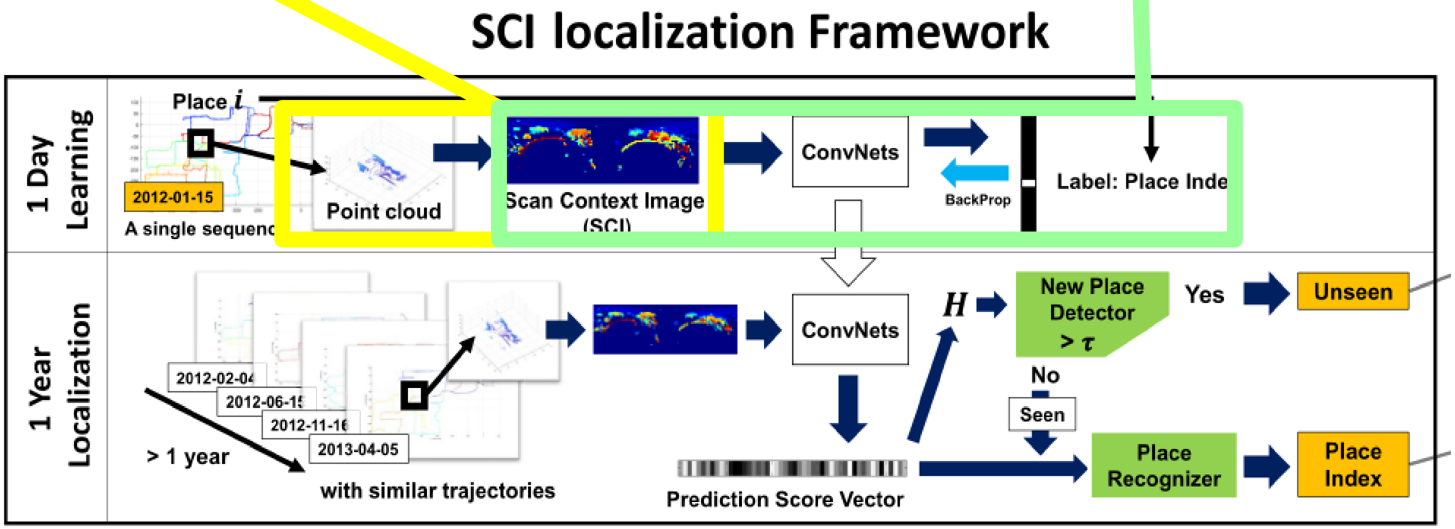
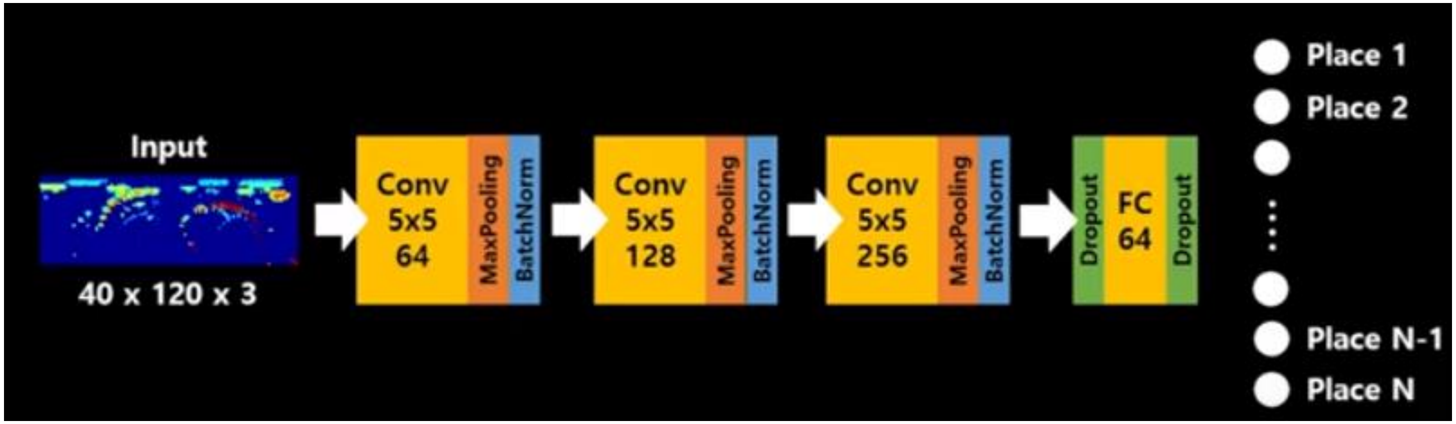
1-Day Learning, 1-Year Localization: Long-term LiDAR Localization using Scan Context Image

Scan Context Image Generation

Training Scan Context Image





1-Day Learning, 1-Year Localization: Long-term LiDAR Localization using Scan Context Image

MVX-Net: Multimodal VoxelNet for 3D Object detection

Vishwanath A. Sindagi, Yin Zhou, Oncel Tuzel,
IEEE Robotics and Automation (2019).

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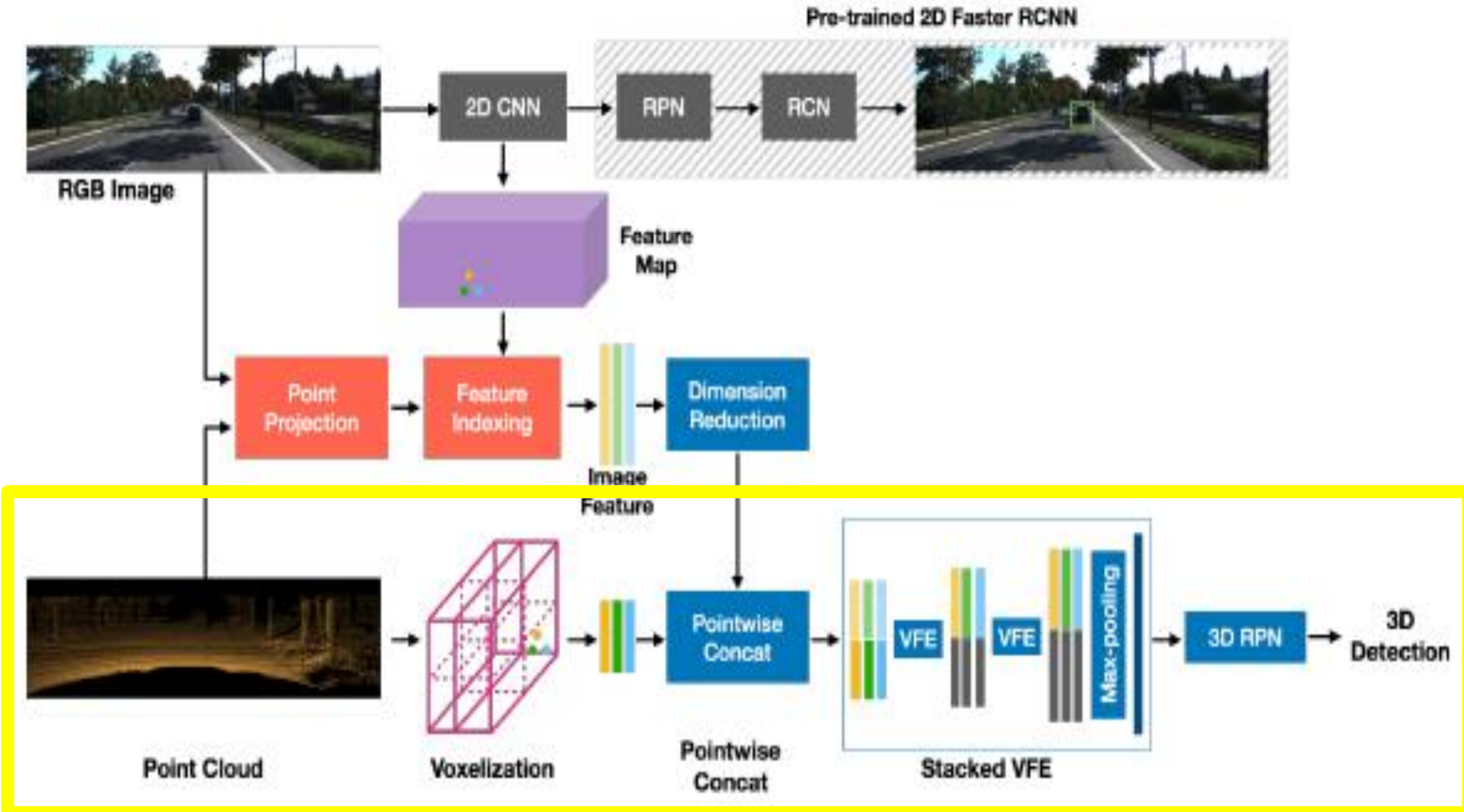
Introduction

- What is goal of this paper?
  - Extend the VolxeNet to Multimodal-VoxelNet

- Contributions
  - MVX-net effectively fuses multimodal information leading to reduced false positives and negatives compared to the LiDAR-only VoxleNet
    - Pointfusion method
    - Voxelfusion method

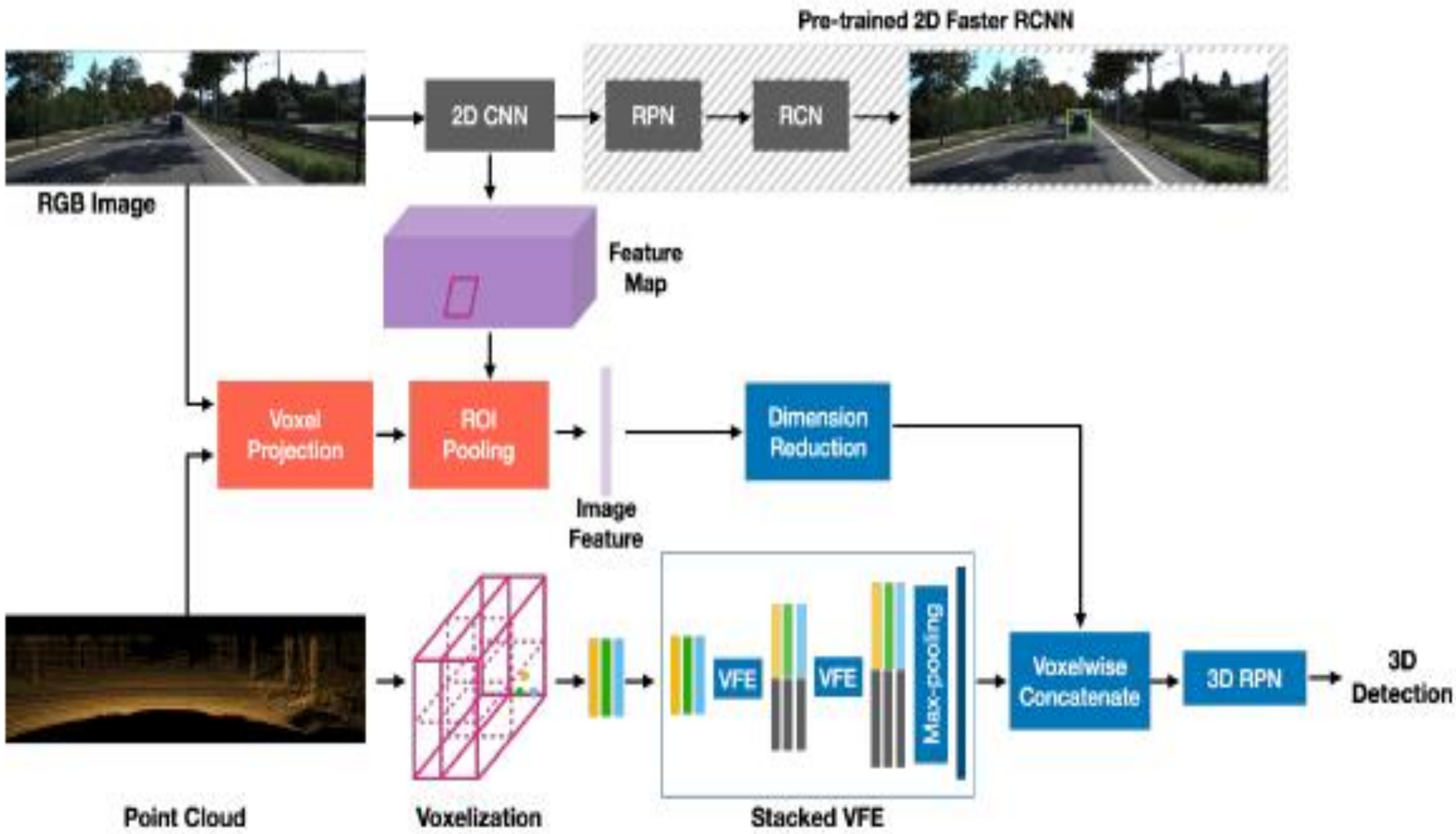
MVX-Net: Multimodal VoxelNet for 3D Object detection

- PointFusion : early fusion method



MVX-Net: Multimodal VoxelNet for 3D Object detection

- VoxelFusion : late fusion method



MVX-Net: Multimodal VoxelNet for 3D Object detection

TABLE I

COMPARISON OF RESULTS ON KITTI VALIDATION SET USING MEAN AVERAGE PRECISION (IN %) WITH IOU=0.7. TOP-2 METHODS ARE HIGHLIGHTED IN BOLD. (S: SINGLE MODALITY, M: MULTIMODAL)

Method	AP_{BEV} (IoU=0.7)			AP_{3D} (IoU=0.7)		
	Easy	Med	Hard	Easy	Med	Hard
Mono3D [3] (S)	5.22	5.19	4.13	2.53	2.31	2.31
3DOP [4] (S)	12.6	9.49	7.5	6.55	5.07	4.10
VeloFCN [18] (S)	40.1	32.0	30.4	15.2	13.6	15.9
MV3D [5] (S)	86.2	77.3	76.3	71.2	56.6	55.3
MV3D [5] (M)	86.6	78.1	76.7	71.3	62.7	56.6
PIXOR [42] (S)	86.8	80.8	76.6	N/A	N/A	N/A
F-PointNet [28] (M)	88.2	84.0	76.4	**83.8**	70.9	63.7
VoxelNet [43] (S)	**89.6**	**84.8**	**78.6**	82.0	65.5	62.9
Baseline VoxelNet (S)	87.6	83.7	78.4	79.5	65.7	64.6
MVX-Net (VF) (M)	88.6	84.6	**78.6**	82.3	**72.2**	**66.8**
MVX-Net (PF) (M)	**89.5**	**84.9**	**79.0**	**85.5**	**73.3**	**67.4**

BEV : Bird's Eye View

TABLE II

COMPARISON OF RESULTS ON KITTI VALIDATION SET USING MEAN AVERAGE PRECISION (MAP) WITH IOU=0.8.

Method	AP_{BEV} (IoU=0.8)			AP_{3D} (IoU=0.8)		
	Easy	Med	Hard	Easy	Med	Hard
Baseline VoxelNet (S)	72.4	62.2	56.5	32.8	28.1	24.6
MVX-Net (VF) (M)	72.2	62.3	61.0	39.5	30.8	29.8
MVX-Net (PF) (M)	74.2	64.5	61.6	43.6	33.2	31.3

Thank you
Q & A