

## Introduction

### Motivation

- Mirrors are prevalent indoors but lead to catastrophic failures in 3D reconstruction
- Important for real-world applications

### Problem statement

- Input:** RGB image or RGB image + raw depth map
- Output:** 3D mirror plane estimate + refined depth map

### Contributions

- Task: 3D mirror plane prediction
- Benchmark with ground truth mirrors
- Annotations for three datasets
  - 3D mirror plane annotations
  - Refined depth maps
- Mirror3DNet for mirror refinement

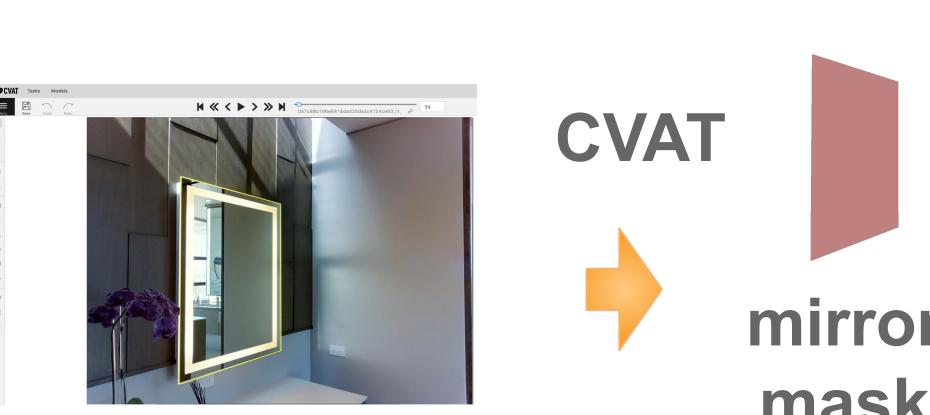
## Mirror3D Dataset

### Dataset construction

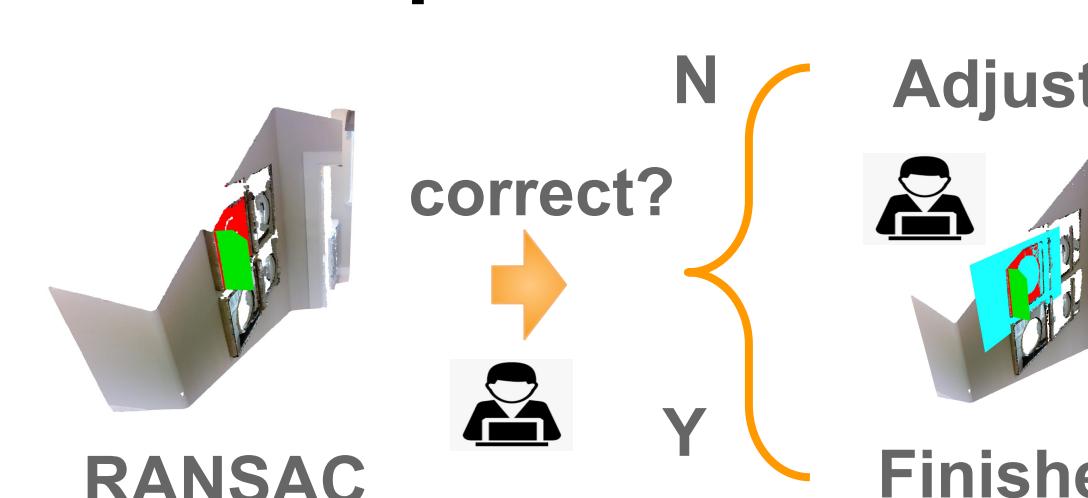
#### I. Mirror image classification



#### II. Mirror mask annotation

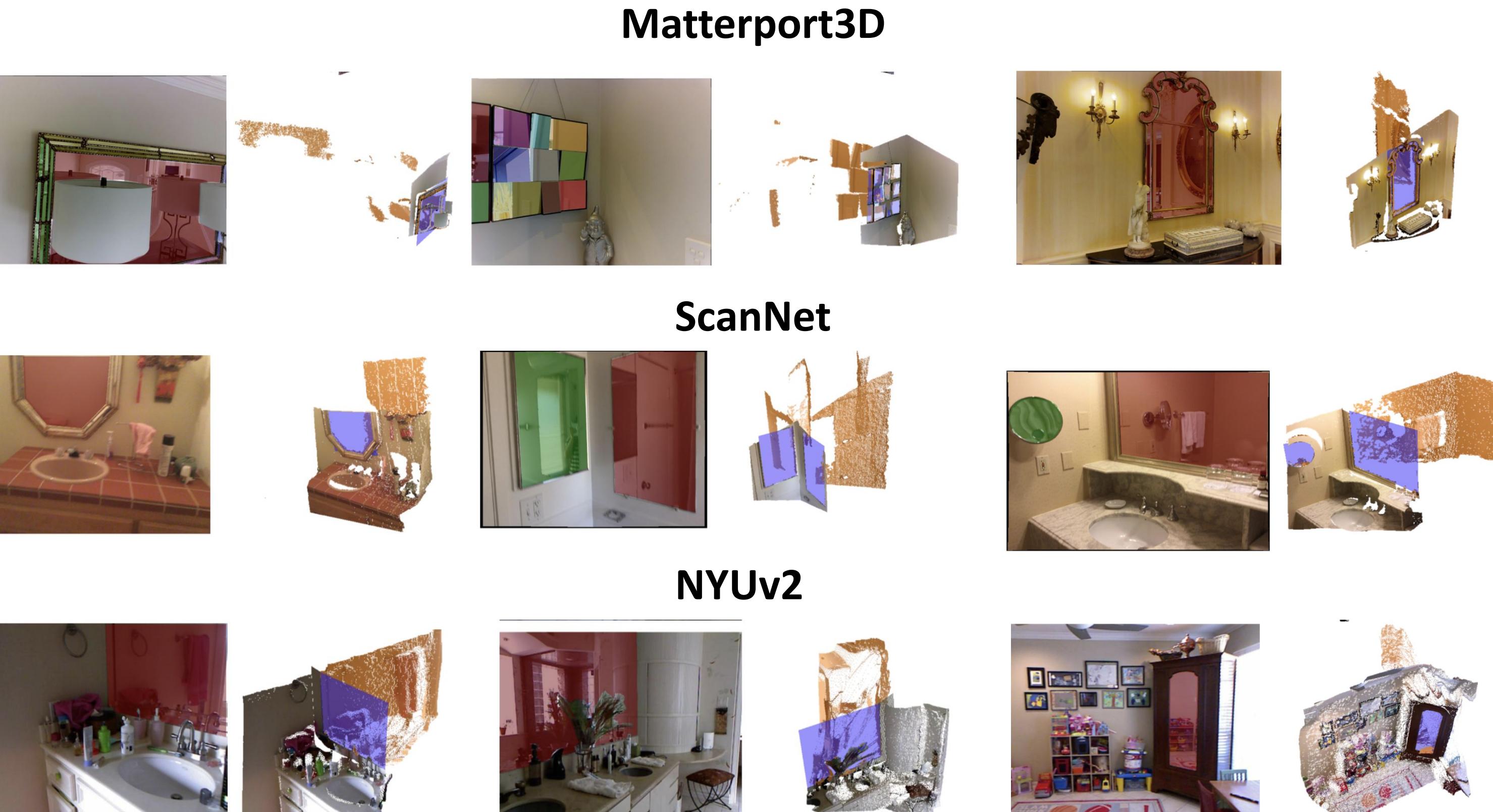


#### III. Mirror plane annotation

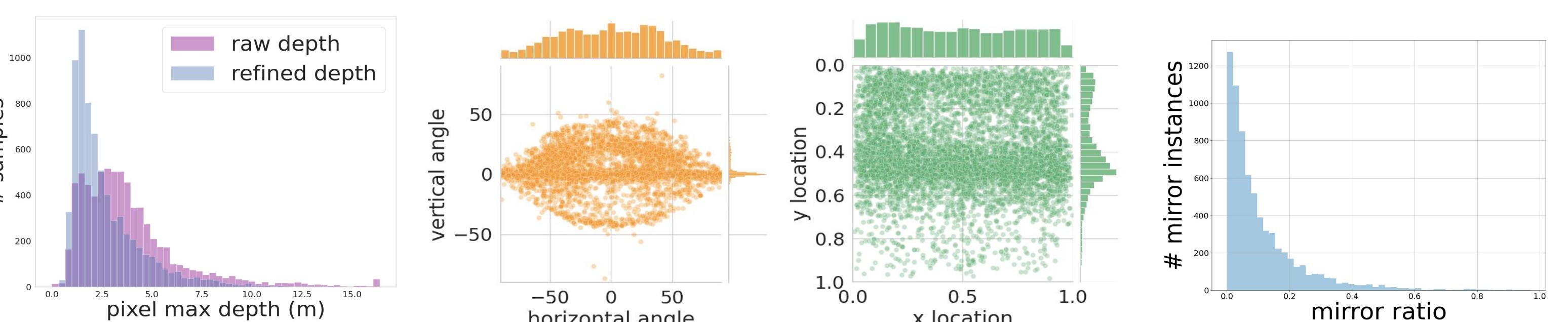


## Dataset overview

4,852 mirror 3D plane and **instance mask** annotations in RGBD images from Matterport3D<sup>[2]</sup>, NYUv2<sup>[3]</sup>, and ScanNet<sup>[4]</sup>.



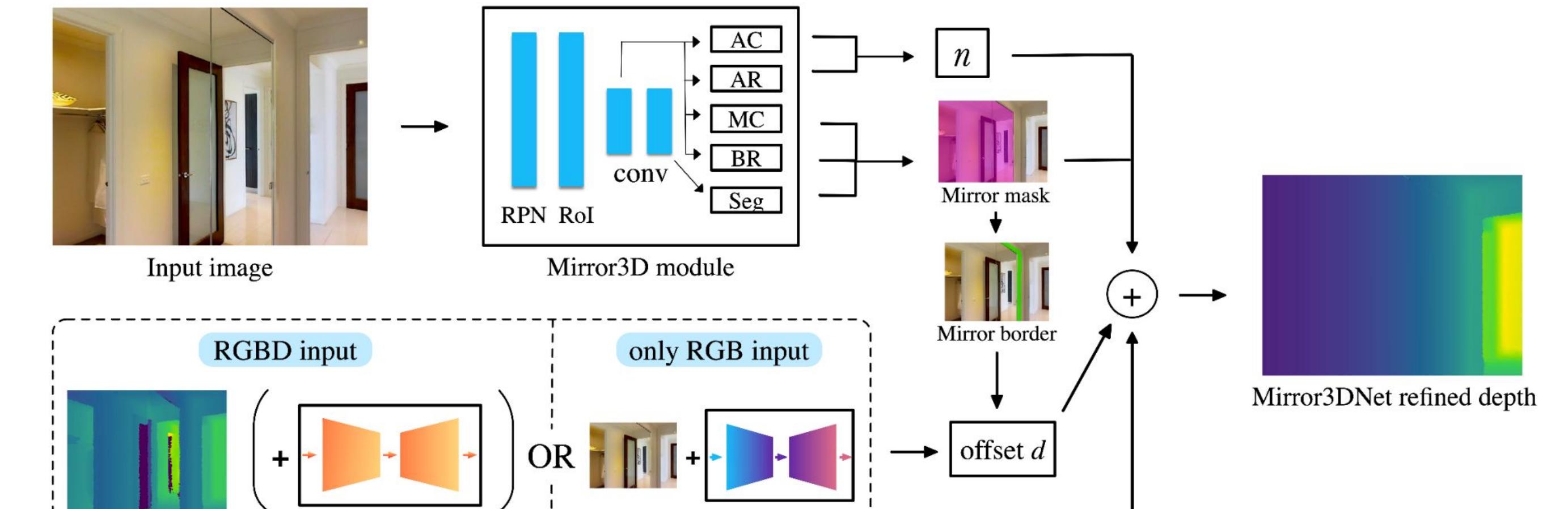
## Dataset analysis



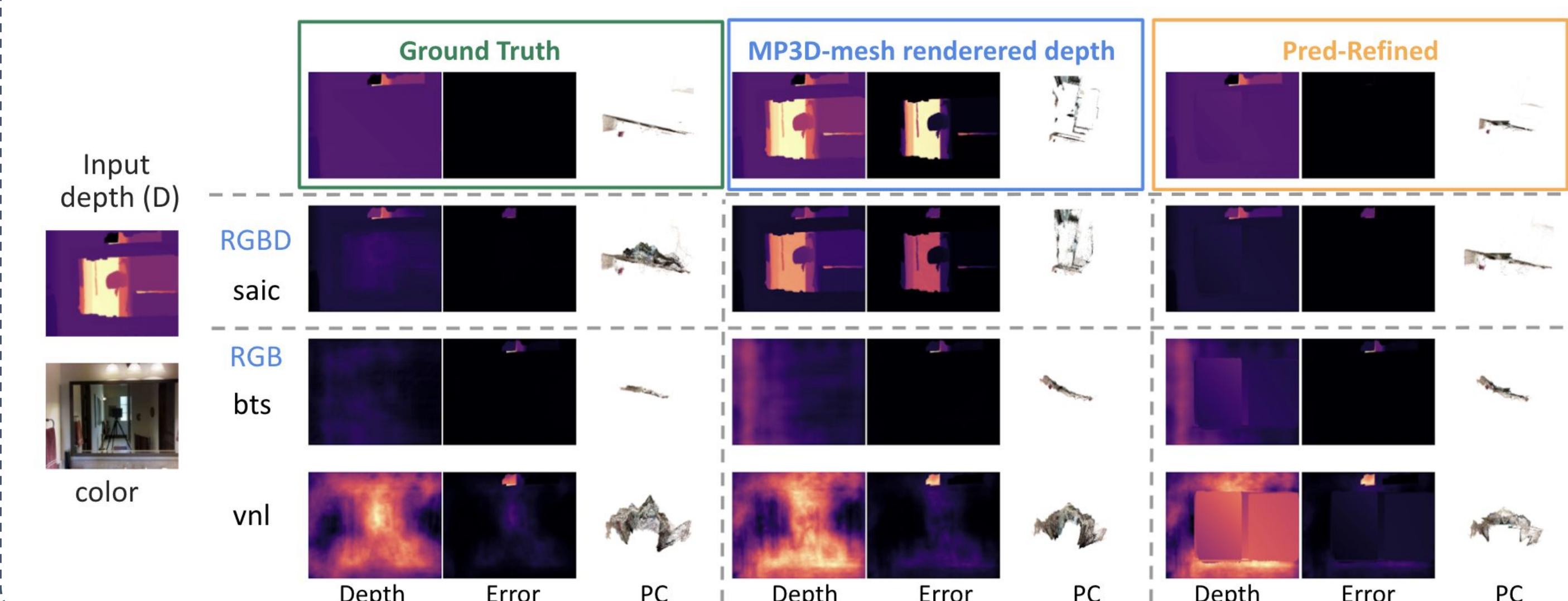
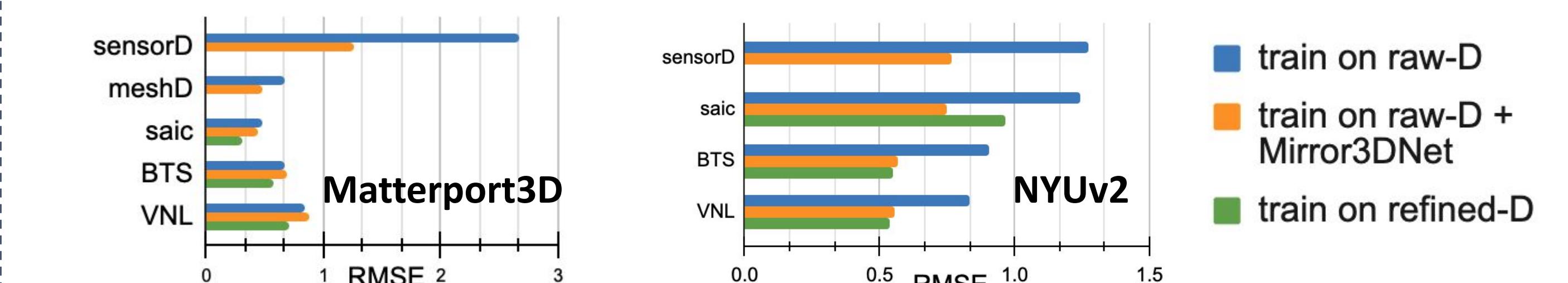
## Conclusion

- Training on refined depth is better than training on sensor depth or mesh depth
- Treating existing sensor depth data as ground truth can misrepresent depth prediction method performance
- Mirror3DNet refines mirror surfaces from depth estimation and completion approaches

## Mirror3DNet



## Experimental Results



- [1] Structured3D: A large photorealistic dataset for structured 3D modeling. Jia Zheng, Junfei Zhang, Jing Li, Rui Tang, Shenghua Gao, and Zihan Zhou. ECCV 2019  
 [2] Matterport3D: Learning from RGB-D data in indoor environments. Angel Chang, Angela Dai, Thomas Funkhouser, Maciej Halber, Matthias Niessner, Manolis Savva, Shuran Song, Andy Zeng, Yinda Zhang. 3DV 2017  
 [3] ScanNet: Richly-annotated 3D reconstructions of indoor scenes. Angela Dai, Angel X Chang, Manolis Savva, Maciej Halber, Thomas Funkhouser, and Matthias Nießner. CVPR 2017  
 [4] Indoor segmentation and support inference from RGBD images. Nathan Silberman, Derek Hoiem, Pushmeet Kohli, and Rob Fergus. ECCV 2012

Project website: [3dlg-hcvc.github.io/mirror3d](https://3dlg-hcvc.github.io/mirror3d)

