POP-3D: OPEN-VOCABULARY 3D OCCUPANCY PREDICTION FROM IMAGES

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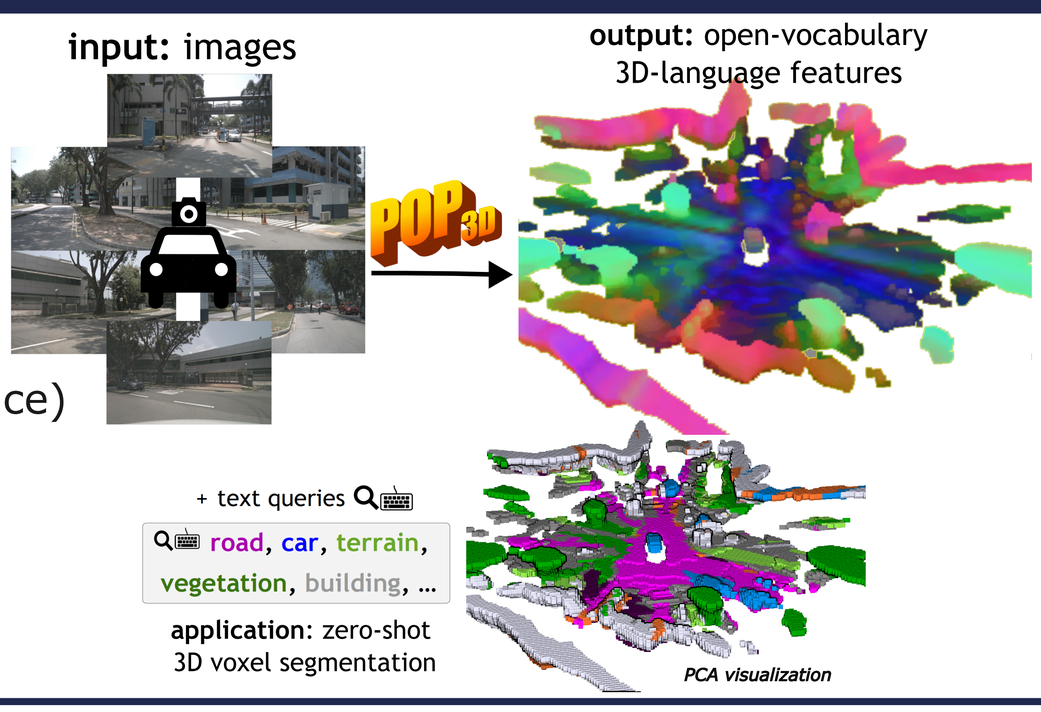
Motivation and Goal

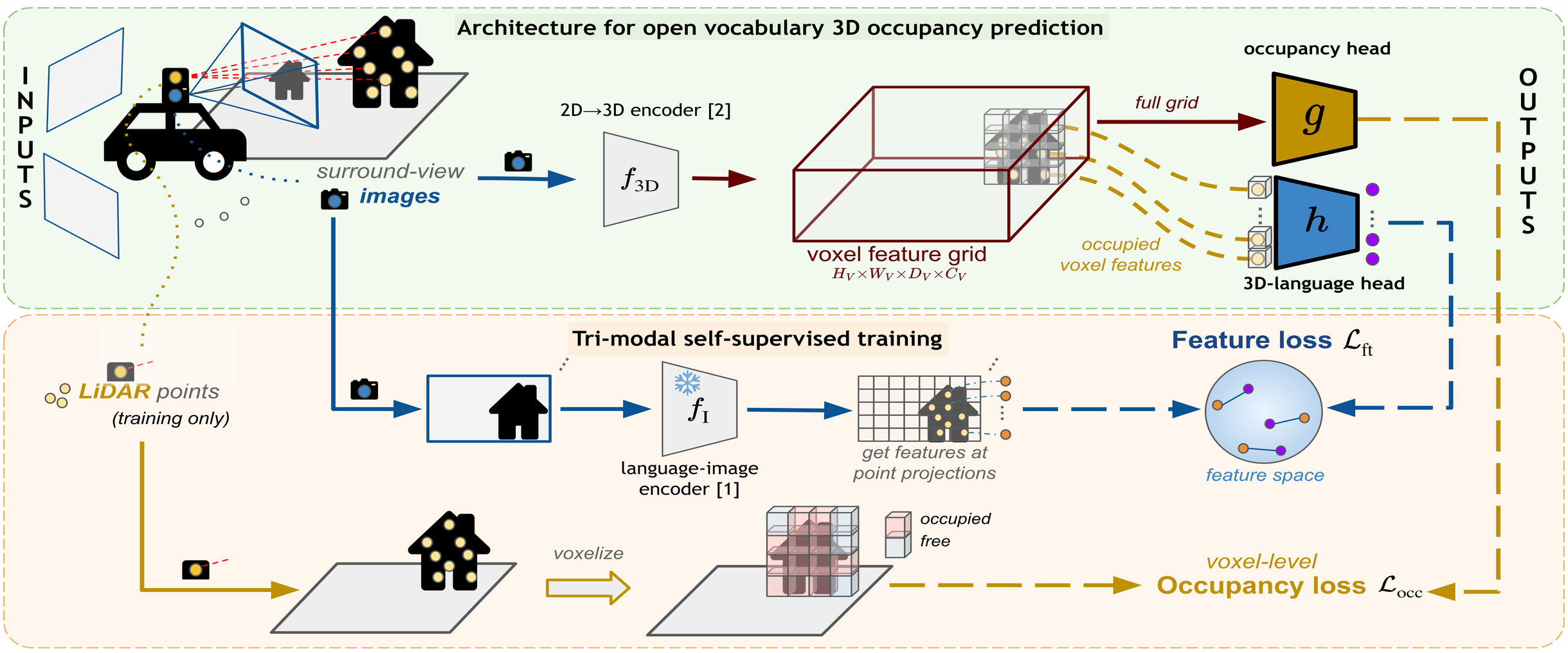
Task: **open-vocabulary 3D occupancy prediction**
- generate 3D occupancy maps from surrounding images, labeling occupied voxels with semantic classes defined using open-form text

Motivation: Tackle the following issues:
- annotations constrained by closed-vocabulary class definitions
- limited availability of sparse LiDAR annotations (expensive to produce)

Goal:
- open-vocabulary 3D semantic occupancy prediction
- *training*: unlabeled image-LiDAR data + pre-trained image-language model
- *inference*: images only



Training

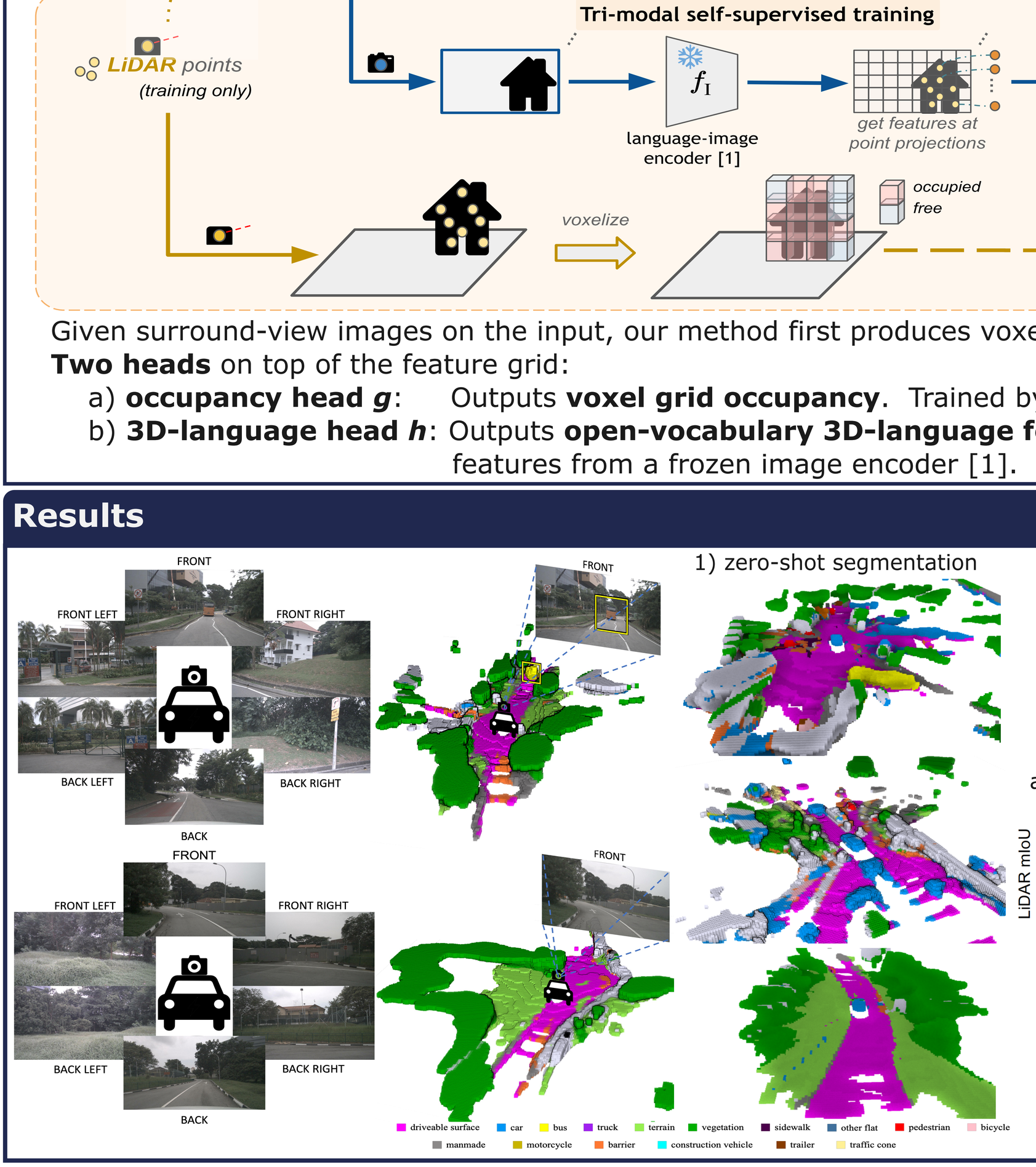


Given surround-view images on the input, our method first produces voxel feature grid using 2D-3D encoder.
Two heads on top of the feature grid:

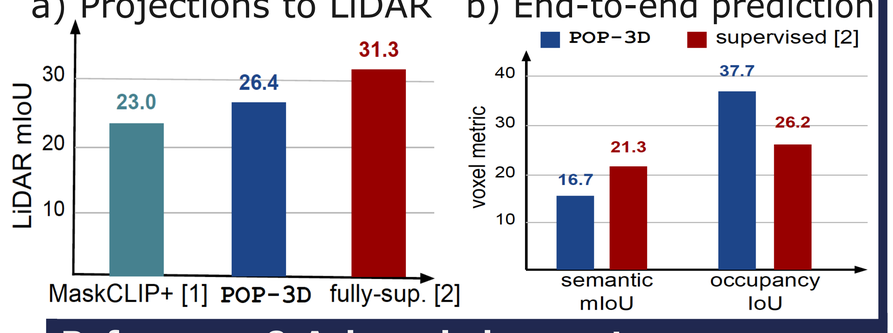
a) **occupancy head *g***: Outputs **voxel grid occupancy**. Trained by occupancy from LiDAR points.

b) **3D-language head *h***: Outputs **open-vocabulary 3D-language features**. Trained by language-image features from a frozen image encoder [1].

Results



Quantitative results



References & Acknowledgements

[1] Chong Zhou, Chen Change Loy, and Bo Dai. Extract free dense labels from clip. ECCV'22.
[2] Yuanhui Huang et al. Tri-perspective view for vision-based 3d semantic occupancy prediction. CVPR'23.

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