

# Short survey on existing methods

09-July-2020

# Topics

1. Deep sub-ensembles for uncertainty estimation
2. LiDAR segmentation models
3. OOD Detection methods

# Uncertainty estimation

1. Deep sub ensembles
2. Deep ensembles, MC-Dropout and MC-Dropconnect
3. Bayesian Neural Network
4. Swaroop's master thesis

# LiDAR segmentation models

<u>Projection based</u>	<u>Non-Projection based</u>
KPR-Net	Cylinder 3D
Salsa Next	SPVNAS
SqueezeSeg V3	<b>PolarNet</b>
Multi-Projection Fusion	RandLaNet
<b>Rangenet++</b>	Lattice Net

Datasets:

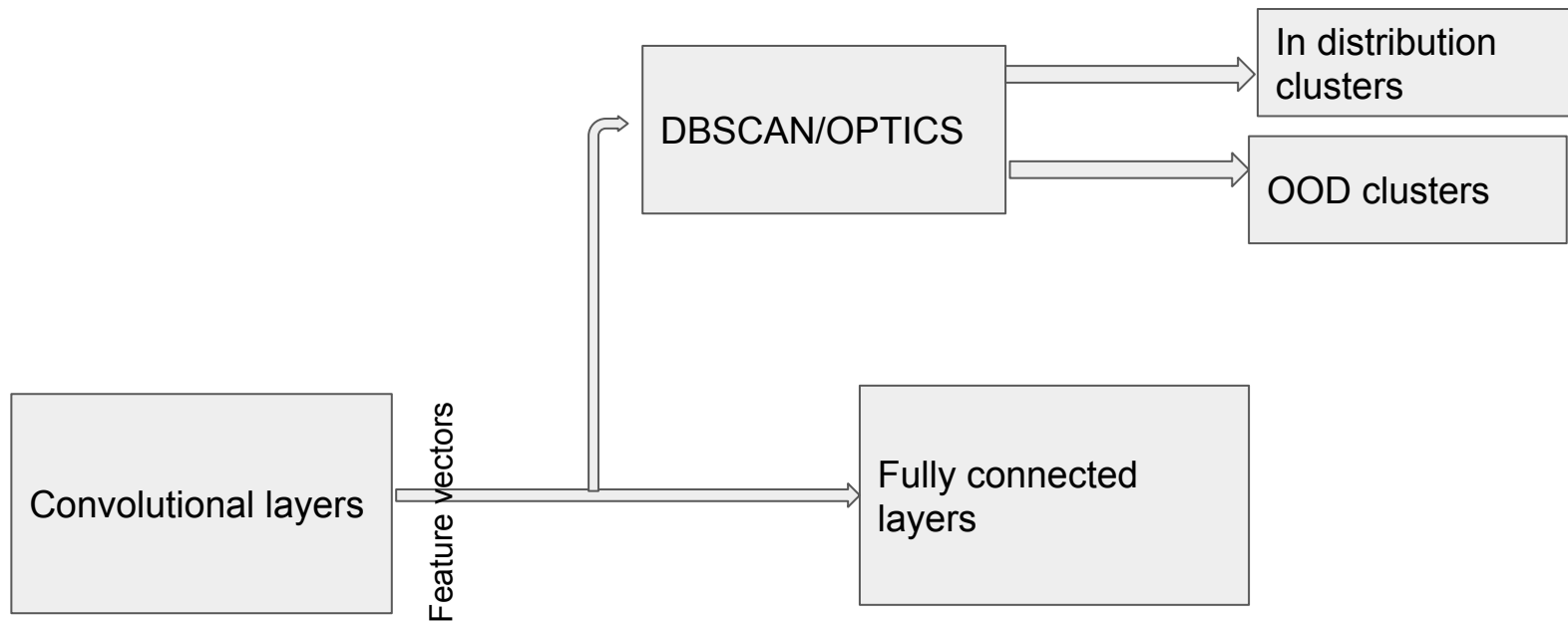
1. Semantic KITTI
2. NuScenes-LiDARSeg
3. Semantic 3D

# OOD Detection methods

## Current Approaches:

- Threshold based
  1. Maximum Softmax Probability (Hendrycks et al, 2016)
  2. ODIN (Liang et al, 2017)
  3. Mahalanobis (Lee et al, 2018)
- Non-Threshold based
  1. Outlier Exposure (Hendrycks et al, 2018)
  2. Gram Matrices (Sastry et al, 2019)
  3. Adversarial Learning with inlier Outlier Exposure (ALOE) (Chen et al, 2020)

# Idea



Reference: <https://openreview.net/forum?id=OkXODFHhfum> [Paper along with reviews]

# Questions:

1. What happens if there is no PCA/t-SNE?
2. Imagenet data is non-linear
3. Comparison with other approaches missing
4. How non-distance based methods like FMM, CRF work instead of DBSCAN/OPTICS?
5. Ensemble of clustering methods as in Lee et al, 2018

# References

- Dan Hendrycks and Kevin Gimpel. A baseline for detecting misclassified and out-of-distribution examples in neural networks. arXiv preprint arXiv:1610.02136, 2016.
- Shiyu Liang, Yixuan Li, and Rayadurgam Srikant. Enhancing the reliability of out-of-distribution image detection in neural networks. arXiv preprint arXiv:1706.02690, 2017
- Kimin Lee, Kibok Lee, Honglak Lee, and Jinwoo Shin. A simple unified framework for detecting out-of-distribution samples and adversarial attacks. In Advances in Neural Information Processing Systems, pp. 7167–7177, 2018.
- Dan Hendrycks, Mantas Mazeika, and Thomas G Dietterich. Deep anomaly detection with outlier exposure. arXiv preprint arXiv:1812.04606, 2018.
- Sastry, Chandramouli Shama, and Sageev Oore. "Detecting out-of-distribution examples with in-distribution examples and Gram Matrices." *arXiv preprint arXiv:1912.12510* (2019).
- Chen, Jiefeng, et al. "Robust out-of-distribution detection for neural networks." *arXiv preprint arXiv:2003.09711* (2020).