Lane Detection Datasets Report

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Abstract

This report provides a comprehensive overview of lane detection datasets, including TuSimple, CULane, LLAMAS, CurveLanes, and VIL-100. We summarize dataset statistics, annotation formats, evaluation metrics, limitations, and their importance in advancing autonomous driving research.

1 Introduction

Lane detection is a vital perception task for autonomous driving systems. Benchmark datasets play a central role in developing and testing lane detection algorithms. The TuSimple dataset tus [2017] was one of the earliest benchmarks but is limited to daytime U.S. highway driving. To address its gaps, additional datasets such as CULane Pan et al. [2018], LLAMAS Behrendt and Mielenz [2019], CurveLanes Xu et al. [2021], and VIL-100 Xu et al. [2022] were introduced to cover diverse driving conditions.

2 Dataset Description

2.1 Dataset Statistics

Table 1 provides statistics of major lane detection datasets.

2.2 Annotation Format

Most datasets use polyline-based lane annotations. TuSimple employs row-anchor based polylines in JSON format. CULane and CurveLanes provide lane segmentation masks. LLAMAS focuses on highway lane polylines, while VIL-100 provides dense annotations for video sequences.

3 Evaluation Metrics

TuSimple evaluates models using lane accuracy (percentage of correctly predicted lane points). CULane employs Intersection-over-Union (IoU) with precision/recall across categories like

Table 1: Comparison of Lane Detection Datasets

Dataset	**Year**	**Images/Clips**	**Resolution**	**Scenes**	**Conditions**
TuSimple	2017	6,408 images	1280×720	Highway (US)	Daytime, clear
CULane	2018	133,235 images	1640×590	Urban, Highway	Day/Night, occlusion, curves
LLAMAS	2019	100k images	1276×717	Highways (Germany)	Daytime
CurveLanes	2021	150k images	1640×590	Challenging curved roads	Day/Night, adverse conditions
VIL-100	2022	12k video clips (100 frames)	1920×1080	Urban (China)	Diverse lighting, traffic

night, shadow, and occlusion. VIL-100 introduces video-based evaluation, enabling temporal consistency assessment.

4 Applications in Research

Lane detection datasets have been used to develop diverse models:

- Instance Segmentation Approaches (e.g., LaneNet Neven et al. [2018]) achieved real-time lane segmentation.
- Parametric Curve Models (e.g., BezierLaneNet Zheng et al. [2022]) fit lanes with Bezier curves.
- Transformer-based Models (e.g., PriorLane Zhou et al. [2022]) leverage prior knowledge for robust detection.
- Video-based models trained on VIL-100 learn temporal consistency across frames.

5 Limitations

- TuSimple is restricted to daytime U.S. highways.
- CULane, though diverse, is limited to Beijing traffic.
- LLAMAS lacks urban driving conditions.
- CurveLanes emphasizes curves but not general traffic diversity.
- VIL-100 is relatively small.

6 Conclusion

TuSimple pioneered lane detection benchmarks, but newer datasets have introduced diverse environments, weather, and temporal aspects. Future research should combine highway, urban, and video-based datasets for comprehensive model evaluation.

References

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