# Uncertainty-Aware Online Extrinsic Calibration: A Conformal Prediction Approach

## Supplementary Material

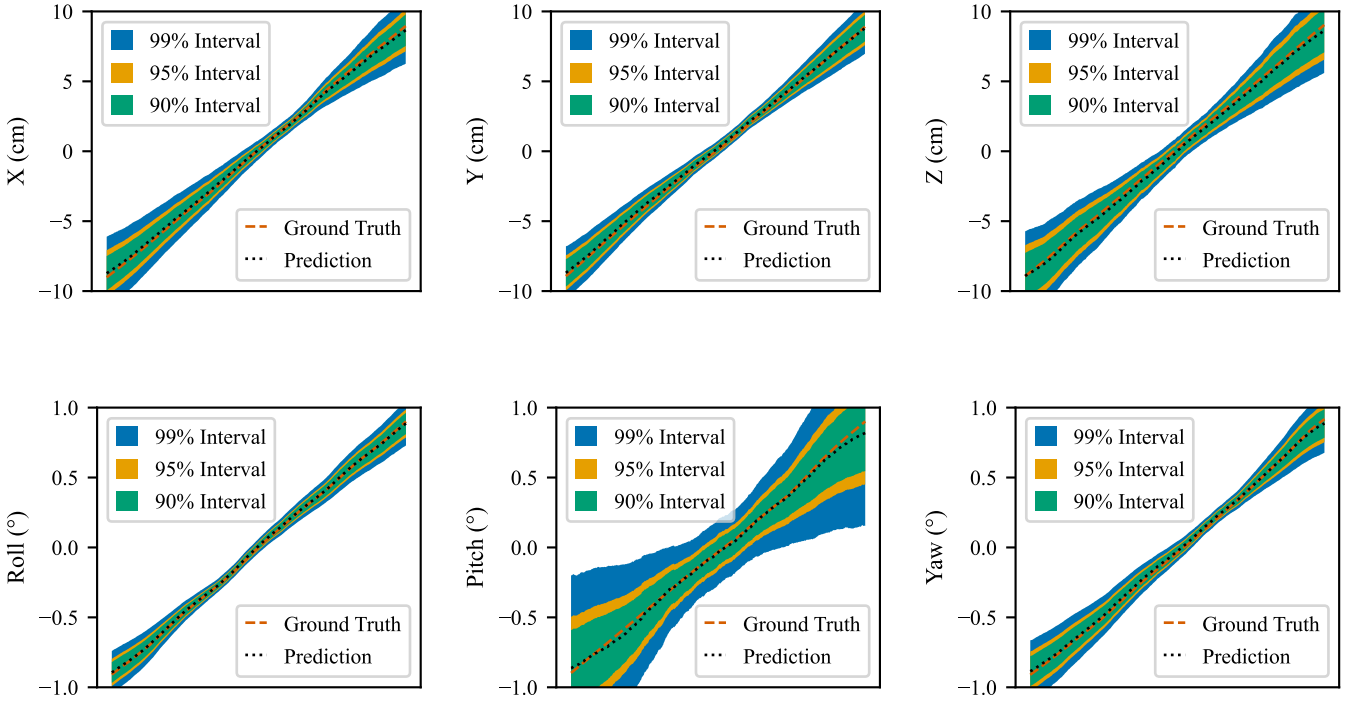


Fig. 1: Ordered prediction interval plots for the six degrees of freedom (in translation and rotation) on the DSEC [1] dataset. The overlaid shaded regions represent the intervals corresponding to expected coverage levels of 90%, 95%, and 99%. The ground truth values should fall within the respective intervals for the specified proportion of samples. The X-axis represents the ordered test samples sorted by the ground truth values for each degree of freedom, while the Y-axis indicates the deviation from the ground truth. All curves are smoothed using a moving average to enhance readability.

### Ordered Intervals on the DSEC Dataset

As shown in Section 4.3.1 of the paper, the results on the DSEC [1] dataset closely align with those from KITTI [2], demonstrating our method's robustness across different datasets. Figure 1 displays good coverage and tight intervals on most axes, similar to the figure presented for KITTI in Section 4.3.3. However, Figure 1 also shows wider intervals for the Pitch rotation, consistent with the observations in Section 4.4.3, which are related to the LiDAR's vertical resolution. Given that the DSEC LiDAR has a lower vertical resolution (with four times fewer channels), the larger Pitch intervals appropriately reflect the increased uncertainty. This wider spread is expected and desirable, as it captures the greater uncertainty inherent in this sensor configuration. Importantly, the interval widths remain small enough on the Pitch to be useful, particularly within the 90% and 95% intervals.

The overall consistency across datasets highlights our approach's generalizability and potential for broader application in autonomous systems. Additionally, the reliable uncertainty quantification across diverse sensor configurations further confirms the effectiveness of our method in camera-LiDAR calibration tasks.

### References

[1] M. Gehrig, W. Aarents, D. Gehrig, and D. Scaramuzza, "DSEC: A stereo event camera dataset for driving scenarios," *IEEE Robotics and Automation Letters*, vol. 6, no. 3, pp. 4947–4954, Jul. 2021.

[2] A. Geiger, P. Lenz, C. Stiller, and R. Urtasun, "Vision meets robotics: The KITTI dataset," *The International Journal of Robotics Research*, vol. 32, no. 11, pp. 1231–1237, Sep. 2013.