FIRE: THE FIRST-YEAR
INNOVATION & RESEARCH EXPERIENCE
CAPITAL ONE MACHINE LEARNING

Survey of Orientation Representations for Improving Vehicle Rotation Estimation with Deep Learning

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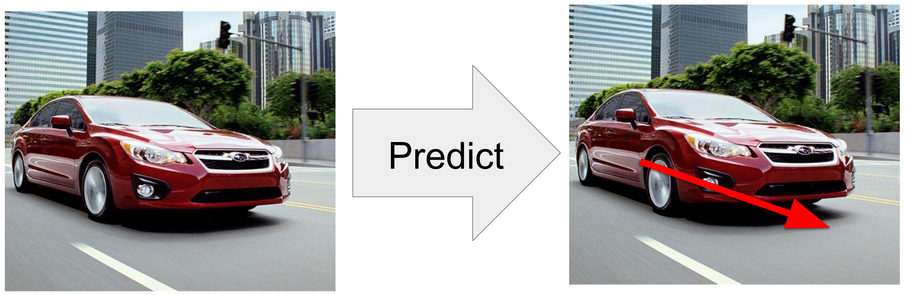
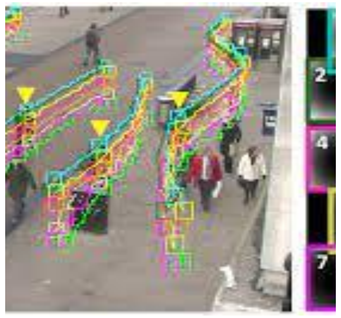
Research Question

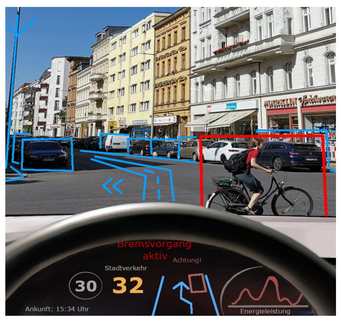
How to represent vehicle angles such that it improves deep learning prediction accuracy?



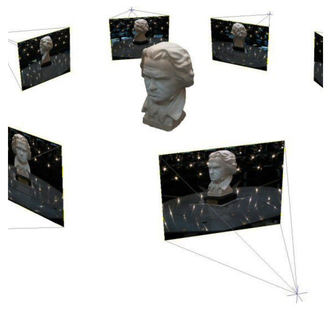
Potential Applications


Robotic Navigation

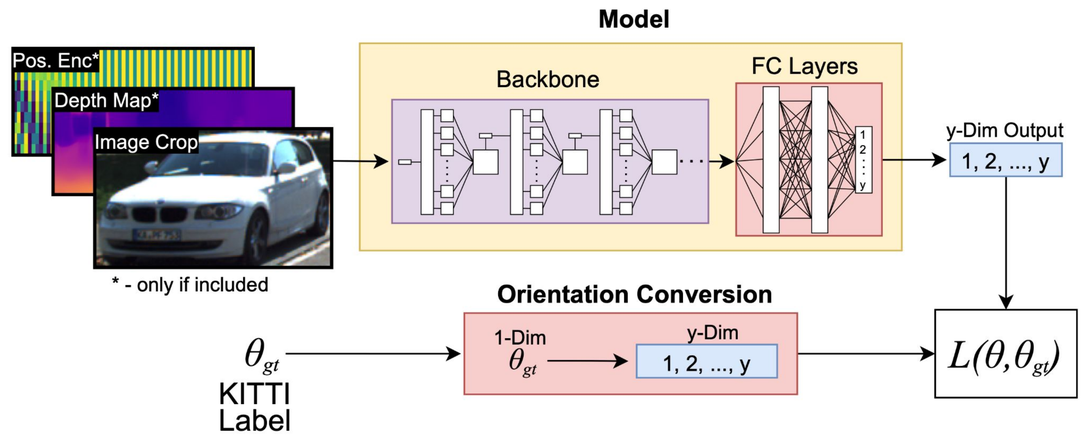

Movement Tracking



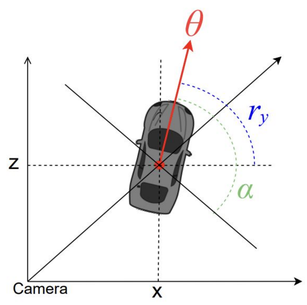
Autonomous Driving


3D Reconstruction

Model Architecture

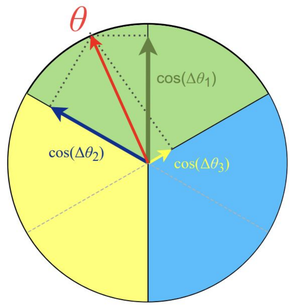


Experiment Results



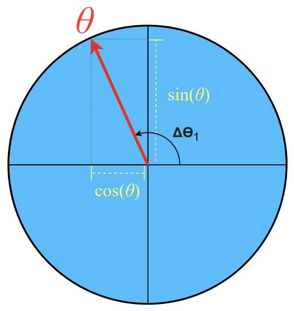
Scalar Rotation - represent the vehicle rotation angle in radians.

Validation Accuracy: 90.49%



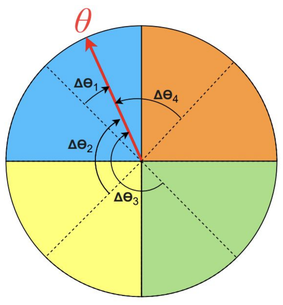
Tricosine - represent angle as the cosine distance to three bin centers.

Validation Acc: 94.25%(↑3.76%)



Cartesian Coordinates - Represent angle as a pair of horizontal and vertical lengths.

Validation Accuracy: 94.82% (↑4.33%)



MultiBin - represent angle as multiple bins where each is represented with cartesian coordinates.

Validation Acc: 93.61%(↑3.21%)