# *Abstract*


Name of the student: **Rigzin Angmo** Roll No: **22103083**

Degree for which submitted: **M. Tech** Department: **Civil Engineering**

Thesis title: **Automated extraction of horizontal curvature attributes using geospatial data**

Thesis supervisors: **Dr.Aditya Medury**

Month and year of thesis submission: **August 2024**



Horizontal curves are pivotal components of road infrastructure, playing a critical role in road design by ensuring safe vehicle manoeuvrability and accommodating changes in direction. Given the frequency of accidents on horizontal curves despite adherence to various design standards, it has become imperative to rigorously verify the presence of curvature in road alignments. Traditional methods for assessing curvature are not only time-consuming but also susceptible to human error.

This study investigates automated techniques for estimating horizontal curvature data to tackle these challenges. It explores several curve estimation methods: the chord method, Taylor series approximation, finite difference method, and spline regression. These methods are applied to the uniformly spaced network survey (NSV) dataset and the non-uniformly spaced data from the OpenStreetMap (OSM).

The chord Method excels with a 92% F1-score on uniformly spaced NSV data but drops to 58% on non-uniform OSM data due to interpolation challenges. Taylor series approximation offers consistency with 90% F1-score on NSV and 82% on OSM, yet its efficacy diminishes as chord length (c) approaches the radius (r). Finite difference performs well with closely spaced NSV data but struggles with noisy GPS points and larger gaps in OSM data. Spline regression upon fine tuning the smoothing parameter achieves 89% F1-score on NSV and 86% on OSM, showing robustness across different datasets. However, the transferability of the radius estimates of the spline regression is inferior when analysing on non-OSM points on the model trained using OSM data.

The findings of the study provide a comparative assessment of different horizontal curvature estimation approaches and their robustness to variability in GPS point sampling. Future extensions of the work can look into the robustness of measurement errors in GPS points as well as differentiation between different curve types based on point-based curvature assessment.