Summary

This thesis aims to formulate a framework for unsupervised outlier detection for spatiotemporal trajectories of moving objects. The study and analysis of abnormality in moving objects are vital as, sometimes, the presence of outliers due to errors in recording of data may invalidate analysis results, and in other times, outliers may provide new insights that are useful.

This framework first introduces three techniques to measure the pairwise dissimilarities between trajectories. The first two techniques use Hausdorff distance and Dynamic Time Warping (DTW) respectively to measure the dissimilarity between two whole trajectories, while the last technique uses Discrete Fourier Transform (DFT) to represent trajectories in low-dimensional feature vectors and distances between these feature vectors can be used to estimate the dissimilarities between the original trajectories. Once the distances between trajectories are computed, two classical outlier detection techniques, namely Kernel Density Estimation (KDE) and agglomerative hierarchical clustering, can then be easily extended to detect anomalous trajectories. The methodologies proposed were then experimented on a real-life dataset.

All the analyses in this thesis were done using the R software and the contributions of this paper are that the methodologies explained in this framework can be applied to any dimensions of trajectories and to any fields of moving objects.