Bachelor's Thesis of Glan Vinarito Pakpahan

Mentoring:

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Author	Segment	Key Parameter	Surveying Method	Clustering Method	Personal Parameters
Romanilo et al. [2019]	No specific typology	Speed choice, route choice	GPS	OLS Regression	Age, gender, commute purpose, types of bikes
Clarry et al. [2019]	Steady-speed and variant speed cyclists	Speed choice	GPS	Linear Regression and Multilevel Mixed-effects Regression	Age, gender, cycling experience
Mohammed et al. [2019]	No specific typology	Speed choice	Video Sensors	GMM and DT	-
Lißner et al. (2020)	Ambitious, functional, passionate, pragmatic cyclists	Speed choice, acceleration	GPS	PCA and PAF	Age, gender, type of bike, trip purposes
Poliziani et al. [2021]	Risky and hasty cyclists (RHC) Sly and informed cyclists (SIC) Inexperienced and	Speed choice, disregarding traffic rules, route choice	GPS	k-means and k-medoids	Age, gender

Focusing only strategic levels, the current state of cyclist behaviour lacks a thorough classification at the operational and tactical levels. In contrast to drivers, whose are well-researched and standardized in such models, cyclists exhibit distinct patterns that are still required more work to understand and assess. Closing this gap improves their modelling by better predicting the occurred cyclist's behaviour, accurately capturing the dynamic interactions between cyclists. This work aims to achieve a more effective and accurate classification of cyclists' behaviour. With identifying both classification of cyclists and drivers, a gap in the current state research of the classification of cyclists' behaviour would be identified and addressed with adapting the current research of drivers. Literatures from recent years, spanning from 2019 until 2024 were collected and reviewed, to find the current trend of both research state.

Straßenverkehrs-Ordnung (StVO) regulates between drivers and cyclists in Germany with subjects about overtaking, speed choice, and speed limits differently, this creates a strong motivation to classify cyclists from both the operational and tactical levels. Drivers are measured with explicit and measurable manner such as 1,5 until two meters minimum distance while overtaking and strict speed limits, but cyclists are not subjected to the same, instead receiving less explicit, situationally dependent rules like creating an overtaking manoeuvre to the right or adjusting speed in shared space. Such law imbalance should be reviewed, thereby requiring a thorough classification of the cyclists so that they can then effectively be included into traffic models for better safety measures.

Clustering Methods	Datasets	Accuracy	Complex Relation	Intensiveness
Threshold-based Model				
Fuzzy Logic	Large	+	+	+
Threshold model	Large	+	+	-
Unsupervised Machine Learning Model				
K-Means	Large	-	*	-
Hierarchical	Small	*	+	+
Gaussian Mixture Model (GMM)	Small	+	+	+
DBSCAN	Large	+	+	+
Supervised Machine Learning Model				
Random Forest (RF)	Large	-	+	-
AdaBoost	Large	*	+	*
Gradient Boosting (GB)	*	+	*	+
Hidden Markov Model (HHM)	*	+	*	+
Naive Bayes (NB)	Large	-	-	-
Support Vector Machine (SVM)	Small	+	+	-
Logistic Regression (LR)	*	-	+	*
Multiple Linear Regression	*	*	-	*
Decision Tree (DT)	Large	-	-	-
C4.5 Tree	Large	+	*	+

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