

# Predicting MobilityCoins Users' Crowdfunding Spending Behavior Using Machine Learning: A Random Forest Modelling Approach

## Master's Thesis of Yaseen -

### Mentoring:

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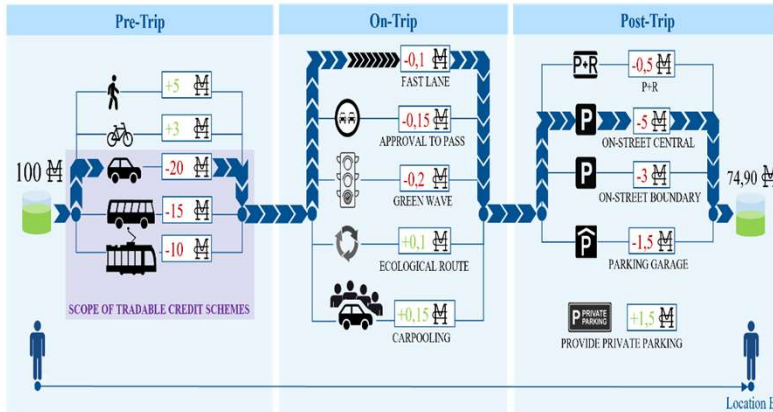


Figure 1: MobilityCoins System through Mode-Choice: Car (BLUM et al., 2022)

### Methodology

The methodology for conducting the thesis started with an extensive Literature Review of all possible models that can be used for prediction problems, two models were selected for further comparison and assessment. Furthermore, a data gathering process using a survey that was deployed over various social media platforms to assess the behavior of participants in the MobilityCoins system in various scenarios of time and budget remaining. In addition, a sensitive analysis was also used to identify the most important features that influence the learning process during the training process of the model by eliminating the features one by one and retrain the models after elimination.

Two different matrices were used for the evaluation process: first Mean absolute error and second one is the Coefficient of determination R.

The data analysis part was done by using R programming language while the Random Forest model as well as Neural Network model were developed using Python programming language.

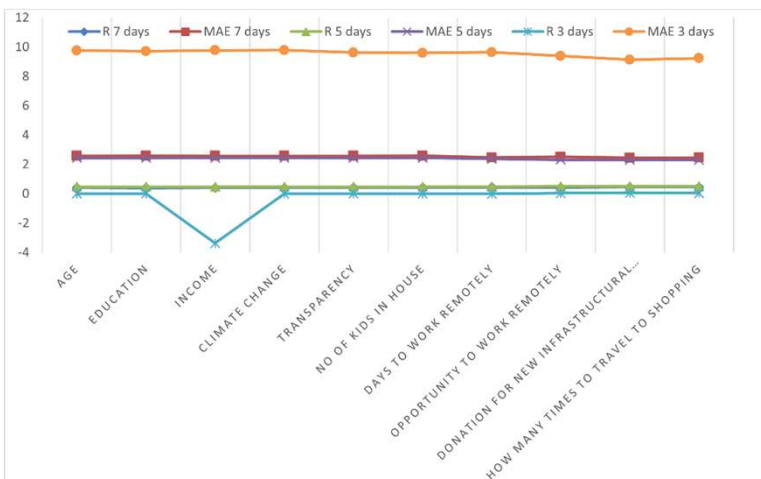


Figure 3: Performance of Random Forest model in sensitivity analysis with sixty MobilityCoins and three days remaining in the budget

### Background

MobilityCoins project aims to develop a tradable mobility scheme where users get a specific amount of coins allocated based on several factors, later on these coins are consumed by users in three different ways: on mobility (supply), selling in the market (trading), and crowdfunding (demand). The inclusion of crowdfunding part in the MobilityCoins system marks its difference from other initiatives. This thesis aims to find a suitable model, either classical or Machine Learning models that can be utilized in predicting the spending behavior of MobilityCoins users, particularly in the context of spending on crowdfunding measures using a survey as a data gathering tool. In addition, this thesis also aims to find the most critical features that may affect the performance of the selected model during the training and testing phase of the model.

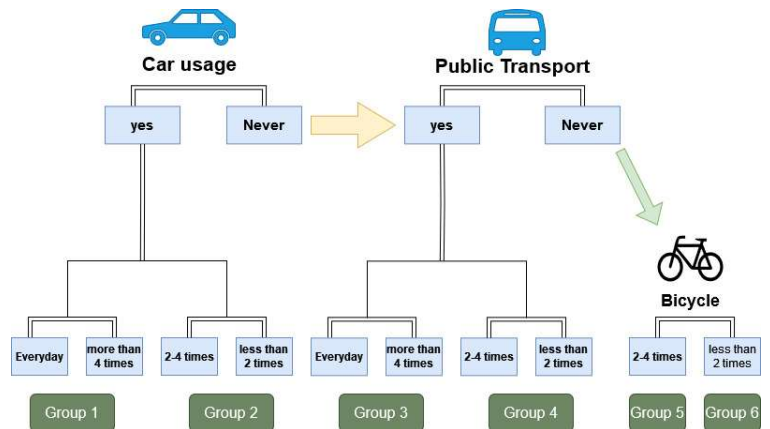


Figure 2: Division of Survey participants based on Mobility behavior

### Findings

The extensive literature review as well as the comparison between artificial neural network and Random forest revealed that the Random forest model performs better in predicting the spending behavior of MobilityCoins users spending on crowdfunding measures across all scenarios except for the last scenario where sixty MobilityCoins as well as three days are remaining in the budget. Additionally, the sensitivity analysis of the features revealed that the performance of the model remains the same across all scenarios even though several features were removed, except when the feature of "income" is removed from the scenario of sixty MobilityCoins with three days remaining in the budget where the model performance deteriorated. However, interestingly, the model regains its performance in the next step of sensitivity analysis as shown in Fig 3.

### References

BLUM, PHILIPP; LISA HAMM; ALLISTER LODER; KLAUS BOGENBERGER (Aug. 2022). "Conceptualizing an individual full-trip tradable credit scheme for multi-modal demand and supply management: The MobilityCoin System". English. In: *Frontiers in Future Transportation* 3. Publisher: Frontiers. ISSN: 2673-5210. DOI: 10.3389/ffutr.2022.914496