

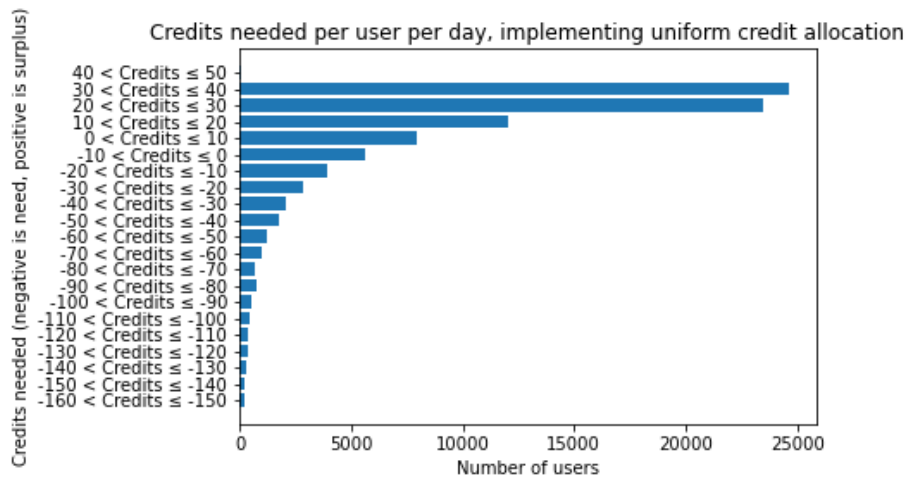
## Master's Thesis of Fadi El Eid

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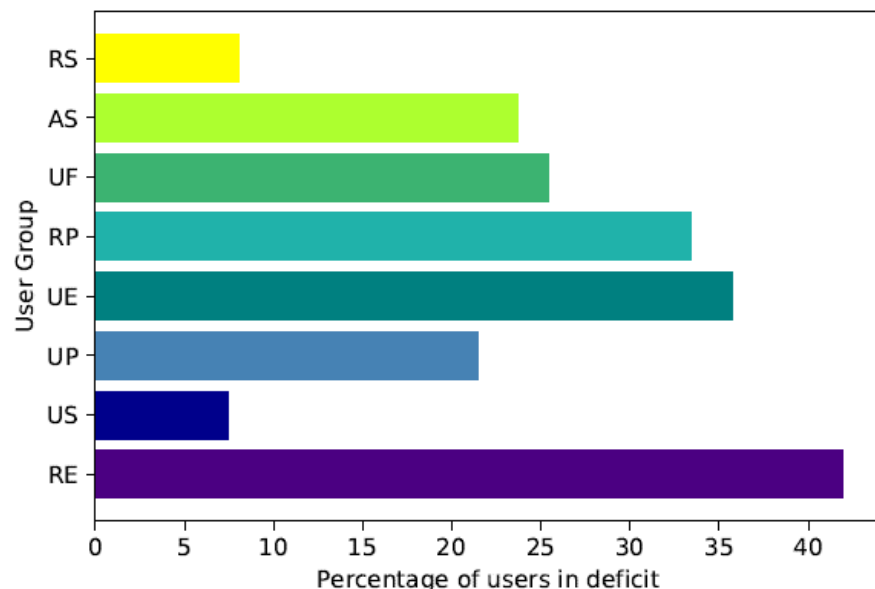
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Distribution of users over the budget brackets after uniform allocation

The project MobilityCoins aims to develop a tradable mobility credit scheme based on the market-based trade and cap system. Its goal is providing the most resource efficient and environmentally friendly allocation of mobility resources. Credits are freely allocated to users as a mobility budget and can be traded on a competitive market. The aim of this thesis is developing different credit allocation strategies targeting the initial freely allocated user budget.

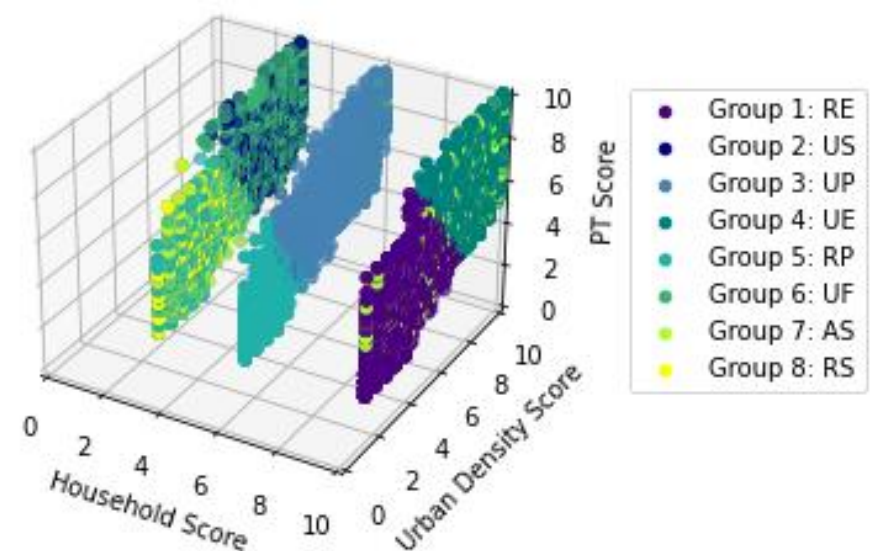
The methodology starts with an overview of the data set from the Mobilität in Deutschland (MiD) 2017 survey and a description of the user characteristics relevant to budget allocation. The route data related to the transport modes used and traveled distance of the users is extracted. Next, a credit charge is assigned per traveled kilometer for each transport mode, based on the related greenhouse gas emissions. Sustainable transport modes cycling and walking are rewarded with a slight credit bonus which acts as an incentive. Combining the credit charge per kilometer (based on the main transport mode) and the traveled distance per trip, the number of credits needed per trip is determined. This is translated to the number of credits needed per user per day after aggregating the trips per user per day.



Percentage of users in deficit for user groups under allocation strategy 4

Based on the data, it is determined users require on average 32 credits per day. It is first proposed that 32 credits per user per day are uniformly allocated across all users. The percentage of users in deficit under this uniformly allocated budget is then analyzed and used as the basis to design different allocation strategies.

For the purpose of user characteristic-based credit allocation, the credits required per user per day data is merged with the user characteristic data over the user-day ID. The considered user characteristics include urban density, public transportation quality and proximity, income, household type and occupation type. A scoring scheme of the different user characteristics is developed and reflects how the user need for credits is influenced by each specific user characteristic. The scoring serves to facilitate clustering the users based on their characteristics. Manual clustering classifies users into different credit-need groups based on the average score of the 5 identified user characteristics. Algorithmic clustering is performed using the K-means algorithm with 8 clusters.



Algorithmic clustering results, showing user characteristic-based scores

Next, the profiles of the different user groups resulting from clustering are described and allocation strategies targeting the determined user groups are proposed. The results show the impact of the different allocation strategies on user groups in terms of the percentage of users in deficit. The advantages and disadvantages of each allocation strategy for the different user groups are evaluated.

The significance of this master thesis lies in creating a mechanism to directly evaluate and compare the impacts of different allocation strategies on users. It allows examining the profiles of users affected by a certain allocation strategy, whether ending up with more surplus or deficit. This would help decision makers reach an informed decision when it comes to implementing a tradable credit scheme while increasing public acceptance. Such process with clearly defined outcomes would support achieving the main goal of the MobilityCoins system, by opening the door to a more sustainable future for mobility.