Chapter 10
Prediction of Payment Method in Carsharing

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ABSTRACT

The rise of urban mobility platforms using VTC licenses (Uber, Cabify, Bolt) allows users to pay in cash or via registered cards/accounts. This study applies machine learning to predict the payment method (card or cash) based on income levels. After cleaning incomplete records, we compiled 280,000 VTC services, focusing on "origin postal code" and "payment method," alongside "disposable average income" from the Tax Agency's IRPF statistics. Results show 85% accuracy, with a training accuracy of 0.865 and test accuracy of 0.808. Precision reached 0.841 (train) and 0.792 (test), recall 0.885 (train) and 0.843 (test), and MCC 0.714 (train) and 0.617 (test). Findings confirm that lower-income postal codes correlate with higher cash

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payments due to financial exclusion, including lack of banking access for irregular immigrants, difficulties in obtaining credit cards for low-income individuals, and account garnishments promoting informal economy reliance.

INTRODUCTION

The widespread adoption of smartphones among the majority of the population has led to a disruption in multiple aspects of daily life in Spain. This transformation has reshaped communication, from the early emergence of BlackBerry Messenger to the later dominance of WhatsApp (Soler, 2024), mobility with the rise of apps such as Uber, Cabify, and Bolt (Hasselwander et al., 2025), and shopping habits with the emergence of Amazon and online supermarket websites (Valadares, 2023). This technological revolution in Spain has transcended social classes, with a smartphone penetration rate of 95% (CNMC, 2023). Not having a smartphone can now be a clear source of social and financial exclusion (Cernadas Ramos et al., 2022).

The key question is whether this trend toward technological democratization has been accompanied by true financial democratization, transforming payment habits (Ferrando et al., 2023). At first glance, the shift from cash to credit or debit card payments seems undeniable due to the numerous advantages of electronic payments, such as physical security, convenience, speed, and the avoidance of carrying coins or banknotes that can be lost or deteriorate. At first glance, the answer seems clear, given the few advantages of cash payments (Gómez Fernández et al., 2020).

To understand the implications of these new mobility trends, it is important to highlight the role of public administrations in promoting alternative fuels to diesel and gasoline. Authorities have encouraged the use of hybrid, electric, hydrogen, and gas-powered vehicles by providing them access to Low Emission Zones and allowing them to operate even if they do not meet minimum vehicle or power requirements (BOE, 2015). It is also important to highlight the fundamental role of public administrations in regulating cash payments. For example, in Spain, paying more than €1,000 in cash is prohibited, in order to prevent money laundering and terrorist financing. (BOE, 2021) However, these types of regulations deprive those who have difficulty accessing electronic money from consuming goods of a certain value, extending financial exclusion and even causing technological exclusion, even in urban environments. (Alcaraz et al, 2021)

In this paper, we will analyze whether machine learning can be used to predict cash payment behavior in VTC journeys based on the average income per inhabitant of the origin postal code.

Therefore, our **hypothesis** is as follows: