Harnessing big data for estimating the energy consumption and driving range of electric vehicles

Analyzing the factors that affect the energy efficiency of vehicles is crucial to the overall improvement of the environmental efficiency of the transport sector, one of the top polluting sectors at the global level. This study analyzes the energy consumption rate (ECR) and driving range of battery electric vehicles (BEVs) and provides insight into the factors that affect their energy consumption by harnessing big data from real-world driving. The analysis relied on four data sources: (i) driving patterns collected from 741 drivers over a two-year period; (ii) drivers’ characteristics; (iii) road type; (iv) weather conditions. The results of the analysis measure the mean ECR of BEVs at 0.183 kW h/km, underline a 34% increase in ECR and a 25% decrease in driving range in the winter with respect to the summer, and suggest the electricity tariff for BEVs to be cost efficient with respect to conventional ones. Moreover, the results of the analysis show that driving speed, acceleration and temperature have non-linear effects on the ECR, while season and precipitation level have a strong linear effect. The econometric model of the ECR of BEVs suggests that the optimal driving speed is between 45 and 56 km/h and the ideal temperature from an energy efficiency perspective is 14 °C. Clearly, the performance of BEVs highly depends on the driving environment, the driving patterns, and the weather conditions, and the findings from this study enlighten the consumers to be more informed and manufacturers to be more aware about the actual utilization of BEVs.

General information
Publication status: Published
Organisations: Department of Management Engineering, Transport Modelling, Transport DTU, University of Queensland
Contributors: Fetene, G. M., Kaplan, S., Mabit, S. L., Jensen, A. F., Prato, C. G.
Pages: 1-11
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Transportation Research. Part D: Transport & Environment
Volume: 54
ISSN (Print): 1361-9209
Ratings:
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.95 SJR 1.359 SNIP 1.853
Web of Science (2017): Impact factor 3.445
Web of Science (2017): Indexed yes
Original language: English
Electronic versions:
manuscript_revised_TR_part_D_Fetene_Kaplan_Mabit_Jensen_Prato.pdf. Embargo ended: 10/05/2019
DOIs:
10.1016/j.trd.2017.04.013
Source: Findit
Source ID: 2358576209
Research output: Contribution to journal › Journal article – Annual report year: 2017 › Research › peer-review