

EGU2020-9456

<https://doi.org/10.5194/egusphere-egu2020-9456>

EGU General Assembly 2020

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From machine learning to sustainable taxation: GPS traces of trucks circulating in Belgium

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Transport geography has always been characterized by a lack of accurate data, leading to surveys often based on samples that are spatially not representative. However, the current deluge of data collected through sensors promises to overpass this scarcity of data. We here consider one example: since April 1st 2016, a GPS tracker is mandatory within each truck circulating in Belgium for kilometre taxes. Every 30 seconds, this tracker collects the position of the truck (as well as some other information such as speed or direction), leading to an individual taxation of trucks. This contribution uses a one-week exhaustive database containing the totality of trucks circulating in Belgium, in order to understand transport fluxes within the country, as well as the spatial effects of the taxation on the circulation of trucks.

Machine learning techniques are applied on over 270 million of GPS points to detect stops of trucks, leading to transform GPS sequences into a complete Origin-Destination matrix. Using machine learning allows to accurately classify stops that are different in nature (leisure stop, (un-)loading areas, or congested roads). Based on this matrix, we firstly propose an overview of the daily traffic, as well as an evaluation of the number of stops made in every Belgian place. Secondly, GPS sequences and stops are combined, leading to characterise sub-trajectories of each truck (first/last miles and transit) by their fiscal debit. This individual characterisation, as well as its variation in space and time, are here discussed: is the individual taxation system always efficient in space and time?

This contribution helps to better understand the circulation of trucks in Belgium, the places where they stopped, as well as the importance of their locations in a fiscal point of view. What are the potential modifications of the trucks routes that would lead to a more sustainable kilometre taxation? This contribution illustrates that combining big-data and machine learning open new roads for accurately measuring and modelling transportation.