The adventures of cars through space and time

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Introduction

Cars are a major source of emissions and energy demand in the UK (CCC, 2020), and the need to decarbonise is promoting the transition to Electric Vehicles (EVs) which is the biggest change in the vehicle stock in decades.

Yet our understanding of how, when, and where cars are used is still limited. Much research relies on small to medium-sized surveys (e.g. National Travel Survey (DfT, 2022)) which lack geographic detail and don't capture infrequent trips that often make up a large part of annual mileage (e.g. vacations). This can make it difficult to plan and develop policy. E.g. where new electric grid infrastructure is required depends on how many EVs, how far they drive, and what type/speed of charging they will require.

This project uses a range of *Big Data* methods across three interrelated projects to improve our understanding of car ownership and use by answering the following questions:

1. How does car ownership and use vary in space and time across the UK?
   - Where is change occurring (e.g. adoption of EVs) and why?
   - Can a better understanding of car use aid the transition to net zero?
2. What are the opportunities and limitations of Administrative Data and Big Data techniques for transport research?
   - Are official records sufficiently accurate and up to date?

Connecting Administrative vehicle data for Research on Sustainable transport (CARS)

The CARS project is working with two Government agencies the Driver and Vehicle Licensing Agency (DVLA) and the Driver and Vehicle Standards Agency (DVSA). To link two large administrative datasets, one about who owns vehicles and where they live, another about annual inspections (MOT tests).

The location of the registered keeper gives a spatiotemporally detailed understanding of car ownership and can be used to understand how cars move when sold or owners move house.

The MOT tests give an annual update on the condition and mileage of each car, revealing how usage varies over space and time.

DVLA
Vehicle & Driver Licencing

DVSA
Annual safety inspection

Validation and cleaning

Secure Linked Data → Anonymised Research Ready Data

Annual data 2006 → Present

Methods

The Big Car Count

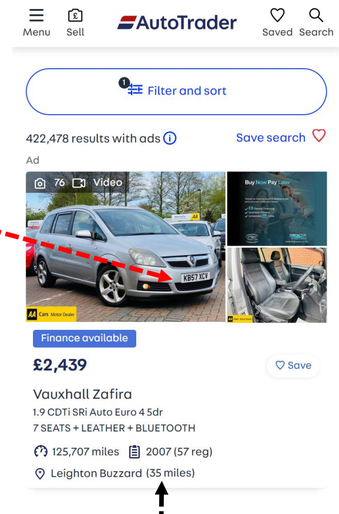
The Big Car Count is a crowd-sourced parking survey based on a web app at www.bigcarcount.co.uk. Users enter a vehicle registration plate and choose one of six parking types. The app then adds time and GPS location to the observation.

The survey was piloted with 80 students in Leeds in March 2024. Students were assigned a small area in Leeds and asked to spend one hour spotting cars parked in residential locations. Areas were selected to be geodemographically diverse. Over 19,000 vehicles were spotted.

Vehicle registration plate enables lookup of other information such a make, model, fuel, annual mileage etc. While location can be used to add demographic data (e.g. Census) and other contextual information (e.g. housing type, rural/urban, access to services).

AutoTrader listings

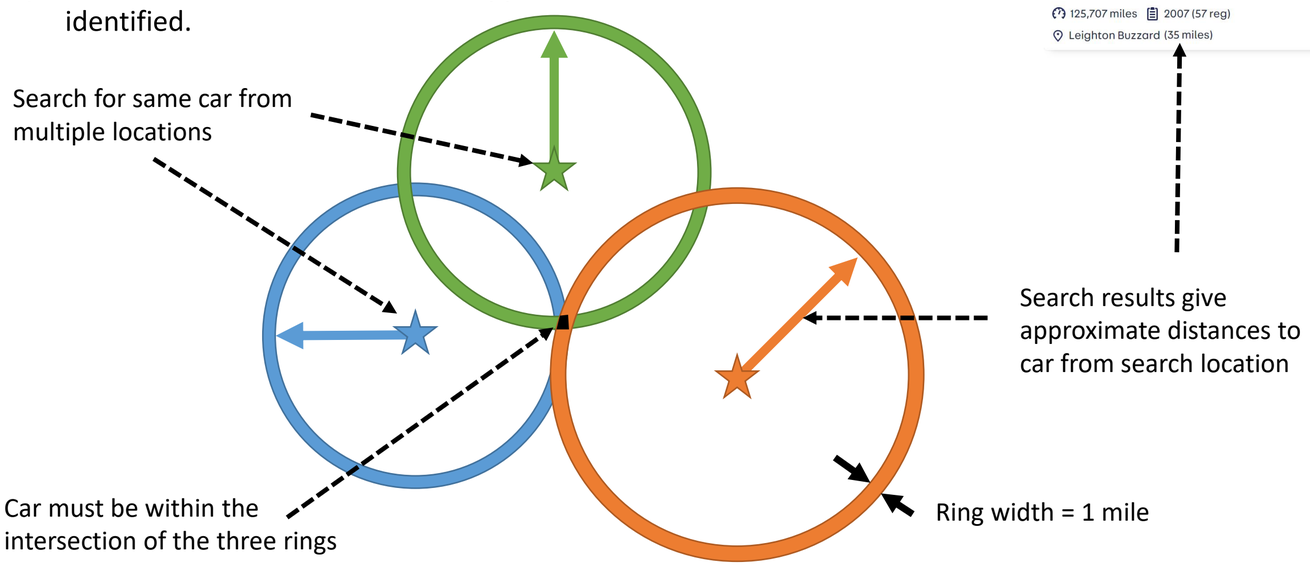
AutoTrader is the largest website for new and second hand car sales in the UK with over 3 million vehicles listed per year. Automated scraping of the website provides data on price, vehicle characteristics, and condition for a significant annual sample (~10%).



This data is supplemented with:

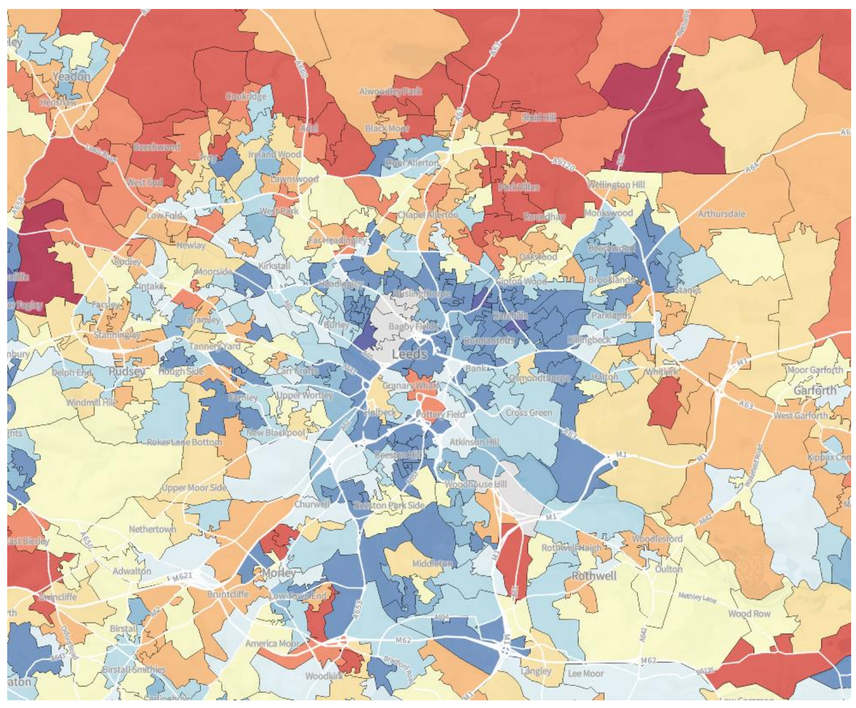
1) Automatic Number Plate Recondition of images enables about 50% of cars to be uniquely identified. Thus can be linked to the other datasets.

2) Trilateration of searches enables approximate location of vehicles to be identified.

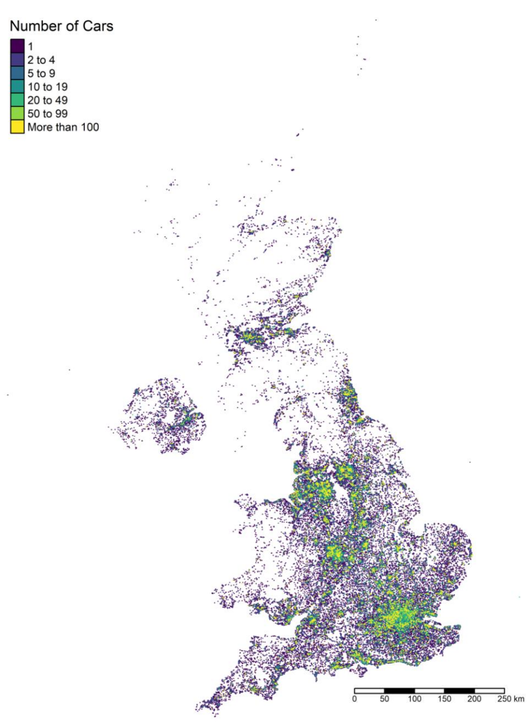


Note: Actual method uses 6 locations to improve precision to +/- 0.5 miles

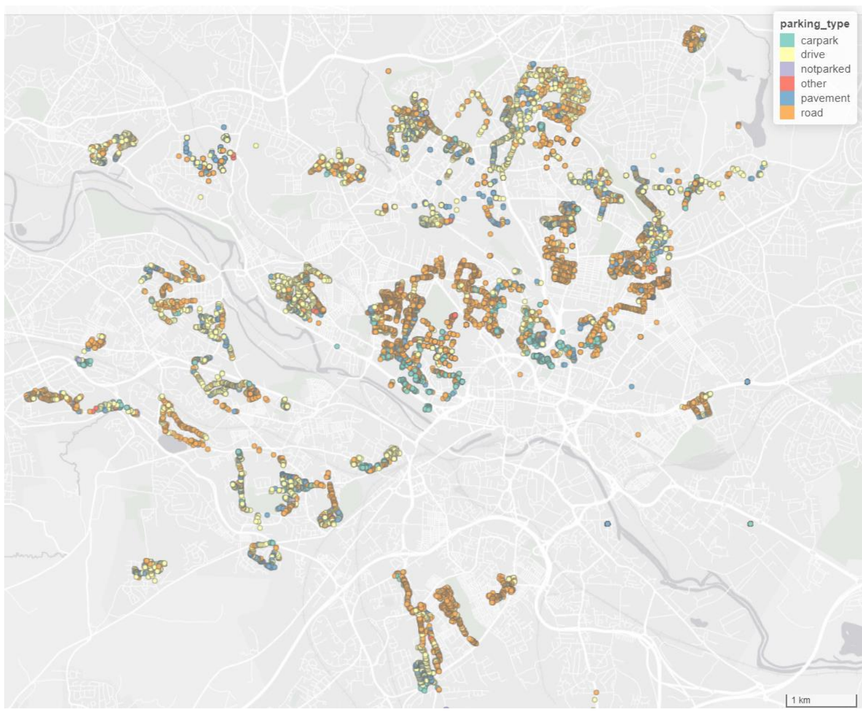
Preliminary Results



Screenshot of Place-Based Carbon Calculator www.carbon.place showing variation in per capita car emissions (red high, blue low) across Leeds. Based on precursor work to the CARS project, which will be updated and improved with this new data.



Over 2 million car listings have already been collected from AutoTrader. Providing a detailed picture of the spatial variation in the new and second-hand car markets.



Pilot results of the Big Car Count in Leeds, over 19,000 parked vehicles spotted by students. Street surveys provide a way to validate to administrative datasets and provide new data on parking usage and the relationship between housing and travel.

Each project is in the data gathering stage and is expected to run for several more years before producing final results. However, early results show that many technical barriers to gathering and processing data on all the cars in Britain can be overcome. Data from AutoTrader and the Big Car Count provide alternative sources that can cross-validate official sources as well as provide insights into topics not covered in official data (second-hand sales, parking, etc.) Preliminary analysis shows significant spatial variation in topics of interest such as the update of EVs which may have policy relevance (e.g. EV uptake is faster in places with off-street parking).

References & Acknowledgements

CCC (2020) Sixth Carbon Budget: Surface Transport https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Surface-transport.pdf

DfT (2022) National Travel Survey 2022: Introduction and main findings https://www.gov.uk/government/statistics/national-travel-survey-2022/national-travel-survey-2022-introduction-and-main-findings

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