Nicolas Vollmer's Answer to the Cobify Tech Challenge!

In this document I discuss my preliminary analysis and findings of your Codify data on fuel consumption.

After checking and cleaning the data, it became clear that we are looking at data for one car only, with each row representing a single trip.

I decided to drop the specials column. The data herein is incomplete and the actual values, where available, are repeated in the ac, rain and sun columns. The column rain may be more appropriately understood as slippery road conditions, as it was also states as 1 when specials talks of snow condidtions.

Understanding that the data speaks of one vehicle only, it is clear that not on every trip did the driver refill gas and therefore the refill_litres and refill_gas columns are empty for most cells. We could fill the NaN values with "0" for refill_litres and "none" for refill_gas, but doing so would likely imbalance the overall data immensely. I therefore decided to drop these columns and proceed without them for the time being. We can always come back again to do more with this data at a later stage.

After cleanup, we did some first modelling and were able to see that:

Figure below: most trips are taken in a range of anywhere between 0 - 50 (I assume km is the measure, not miles) and more specifically in a range between 10 - 20 km. There are some outliers with trips that are much longer

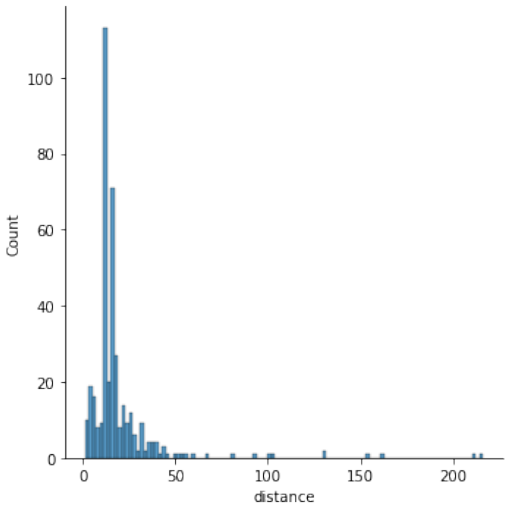
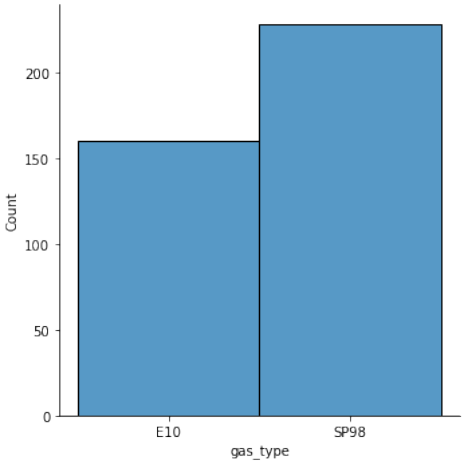


Figure below: The driver used SP98 more frequently than E10



I ran out of time for further data extrapolation. With more time I would model the effect of fuel type on fuel economy with a regression analysis. There are other obvious relations we can explore, such as road conditions (optimal would be dry when sunny, less optimal would be slippery with rain/snow conditions), AC operation (any but especially higher AC settings on hot or cold days are proven to result in less engine performance and higher fuel consumption), outside temperatures (too high or too low again results in poorer performance and higher consumption) and average speed (repeated low speeds and stop&go traffic conditions result in exceedingly higher fuel consumption, excessively high speeds on motorways as well). I could further expand the dataset with that of other cars and their metrics. But there is already a wealth of information on the topic, on which I based my suggestions below.

On this page, I will make some first suggestions to the target company Cobify.

The company is clearly very passionate about tricked-out high-end cars and the physics behind fuel type mixtures. However, they expressed a desire to become more eco-friendly, but as they highlighted in their initial case this comes at a high cost of conversion. It is true that higher cetane fuels like unleaded 98 lead to lesser consumption, but given the considerable markup on per-litre price for these fuels it is understandable that they are considering a switch to E10, which use ethanol and a legally defined minimum measure of renewable fuels (derived from agriculture), therefore making them greener.

In the short term, I would suggest a permanent switch to E10 should be considered, as the fuel savings for SP98 had been found to be negligible, especially given the much higher per-litre cost! This leads to a more economical operation, and cost savings could be passed on to clients or, better yet, saved for reinvestment into further strategic changes in the long term as I will discuss further below.

In the medium to long term, I would suggest a restructuring of the company fleet towards greener vehicles. This may be unreasonable, as I understand the Cobify team to be true petrol-heads, however the overall trend in the market and rising consumer consciousness towards climate change and a greener way of life for climate preservation speaks a fact that Cobify's business model may lose serious appeal to a majority of clients in the near future! The company should therefore consider a slight rebrand. We can still focus on high-end cars that are tricked out, but switch the fleet over to either electric or hybrid vehicles. The investment cost of entry to these propulsion classes may be higher, however there is an expanding range of high-end options as more and more manufacturers are capitalising on this trend. This means that there is a wider set of options of vehicles at more affordable prices across the board. A fleet of Tesla or especially Mercedes, Audi or Porsche limousines with fully electric powertrains still means the company can lay claim to the high-end car moniker, while at the same time marketing towards the green and renewable trend!

A concern many prospective buyers see with electric vehicles is overall range and recharge speeds. This is of course a factor with a transportation business, where vehicles ideally are utilised to their maximum extend. However, many new electric cars especially have very high recharge speeds on the right recharge facilities and several hundred kilometres of range on a full charge. The downtime during charging breaks should be used for driver breaks which are legally a requirement anyways.

Fully electric cars also perform much better in city environments, which often see stop&go traffic conditions where gasoline cars traditionally burn more fuel.