CAISR

## Centre for Applied Intelligent Systems Research

Learning Fleet

Fuel consumption depends on many aspects of a truck, such as driver behaviour, cargo, vehicle condition, as well as on external circumstances like weather or terrain.

Isolating the influence of those factors over which fleet owner has control from the objective ones is, however, difficult. In the FuelFEET and Learning Fleet projects, a pilot study was run using data mining over the available data (collected in EuroFOT and CUFF projects) to assess which are the major driver-related factors affecting fuel consumption and to quantify their impact, finding a way to abstract away or compensate over external conditions.

VOLVO The Customer Fuel Follow-up project is designed to gather data for in-depth analysis and comparison of fuel consumption and fuel efficiency. A major feature of CuFF experiment is the addition of a high precision fuel measurement sensor.

EuroFOT, the first large-scale European Field Operational Test on Active Safety Systems, has given Volvo Trucks Technology, as a partner, the opportunity to collect vast amounts of data that can be used at the forefront of Energy Efficient Transport.
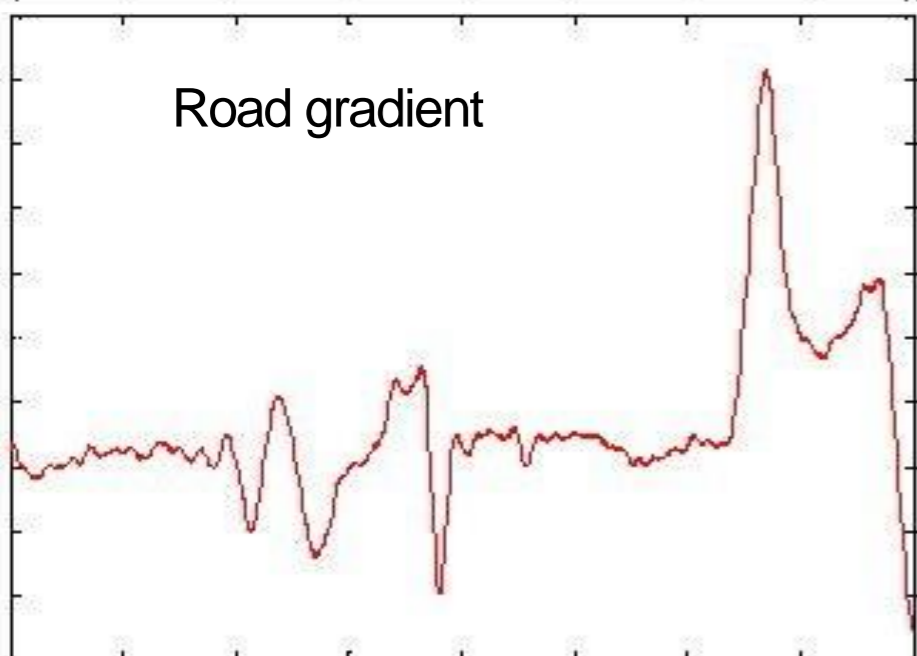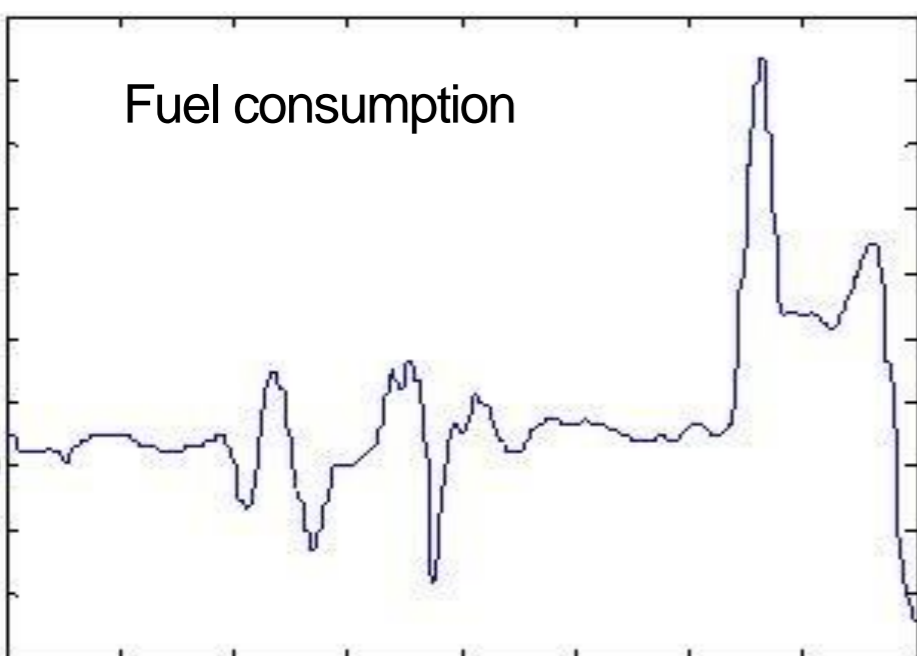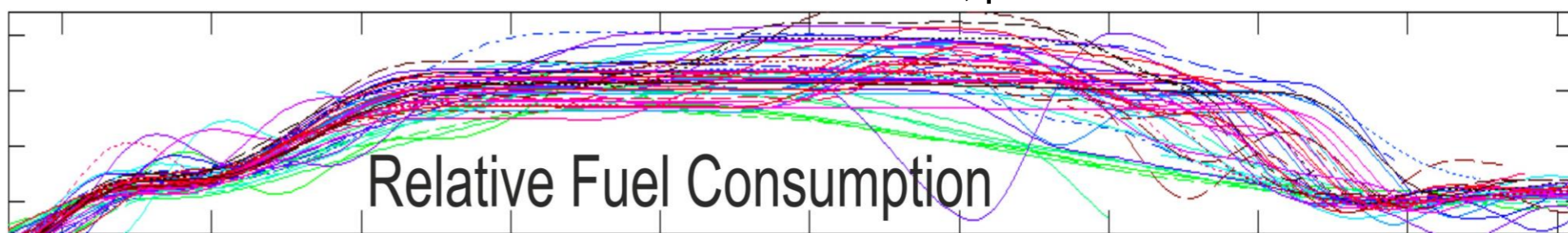

Absolute Fuel Consumption
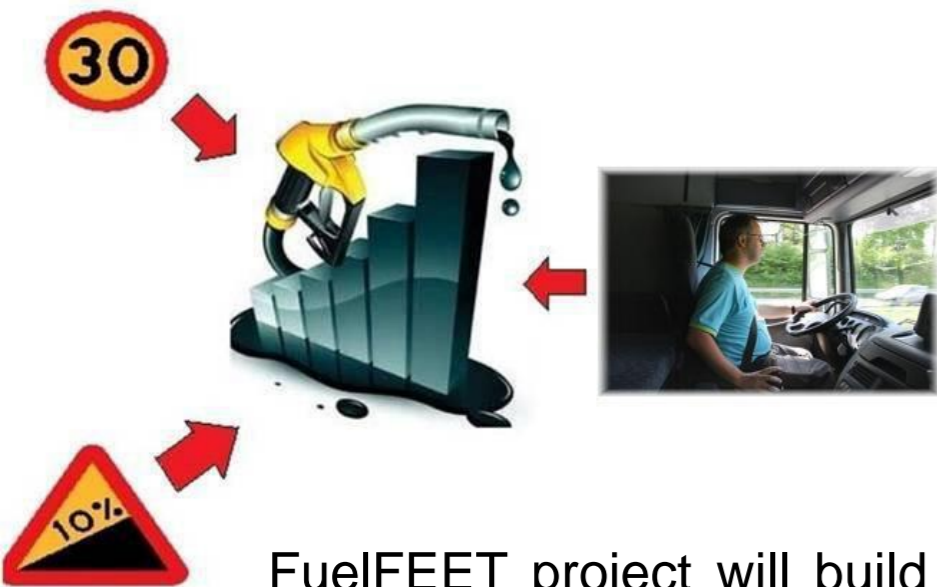
FuelFEET project will build a framework for analysing the impact that drivers have on fuel consumption, taking into account relevant environment factors.
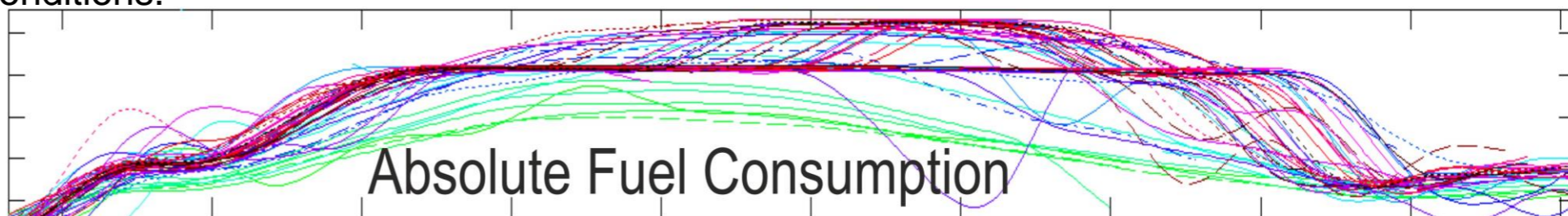
Many factors that influence fuel consumption are not well understood, in the quantitative sense at least. Therefore, it is common to compare fuel consumption over time, and hope that the external factors even out. In our work we focus on normalising fuel consumption by capturing the influence of factors that are out of driver's control. This way we can meaningfully compare the relative changes in fuel consumption for the situations we are interested in.

As an example, the plot above shows a number of trucks overtaking a single hill. Vehicles are colour-coded based on cargo weight, thus it is clear that absolute fuel consumption does not allow for as good a comparison between different missions as does our relative measure, presented below.

Relative Fuel Consumption

Fuel consumption

One of the most important factors in fuel consumption is the road topography, and thus we can analyse how fuel consumption depends on road gradient. The example two plots on the left show that those two properties are very closely related, especially when looking at the big picture, at the larger scales of minutes and kilometres.

However, we are particularly interested in instantaneous fuel consumption, since that is what we need to evaluate overall awareness and individual decisions made by the driver in various situations. At this level, the dynamics of the vehicle as a complex system become more and more important, by introducing local distortions.

Figure below shows the effects of delays introduced by engine control and physical properties, resulting in differences between recorded and expected fuel usage. Those need to be understood and quantified for a driving recommendation to be offered.

Road gradient

Fuel consumption
Road gradient

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