



Driver behavior affects on traffic safety, energy consumption and greenhouse gas emissions

Driving style assessment and driving events detection
can be fully automated thanks to AI.



Problem definition



- Driver behavior causes the vast majority of motor vehicle accidents.
- The total cost of motor vehicle crashes in the United States is estimated at \$1 Trillion / Year.
- Pay-How-You-Drive can make car sharing cheaper by rewarding drivers with good driving scores.
- Good driving behavior increase resource economy, and vehicle lifetime.
- Notificationsof unsafe driving events presented to drivers in real-time can help prevent accidents
- Monitoring driver behavior is **profitable**.

How to do it?



- Driver analysis is the process of automatically collecting driving data and applying a computational model to them in order to generate a safety score for the driver and detect dangerous events.
- Driving data may come from several kinds of sensors, like smartphones, monitoring cameras, telematics boxes, and On-Board Diagnostic (OBD) adapters.
- Real time machine learning algorithms analyze data using on-board computers, connected smartphones or servers in the cloud.
- Valuable results are presented to the driver and interested parties.

Data source

1. The dataset is a collection of smartphone sensor measurements for driving events
2. An Android application is used to record smartphone sensor data, like accelerometer, linear acceleration, magnetometer and gyroscope, while a driver executed particular driving events.
3. The authors provide labels for 7 driving events.
4. The data comes from <https://github.com/jair-jr/driverBehaviorDataset>

Available features

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Features collected by the authors are:

Timer with milliseconds
precision

Accelerometer

Linear acceleration

Gyroscope

Magnetometer



Available events

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Classes selected for prediction:

Aggressive acceleration

Aggressive breaking

Aggressive right turn

Aggressive left turn

No event

Aggressive left lane change and aggressive right lane change are also available, but they have far fewer examples due to errors during the experiment

Conclusions

Results



accuracy = **93%**
macro average f1 = **93%**



The model predicts very fast

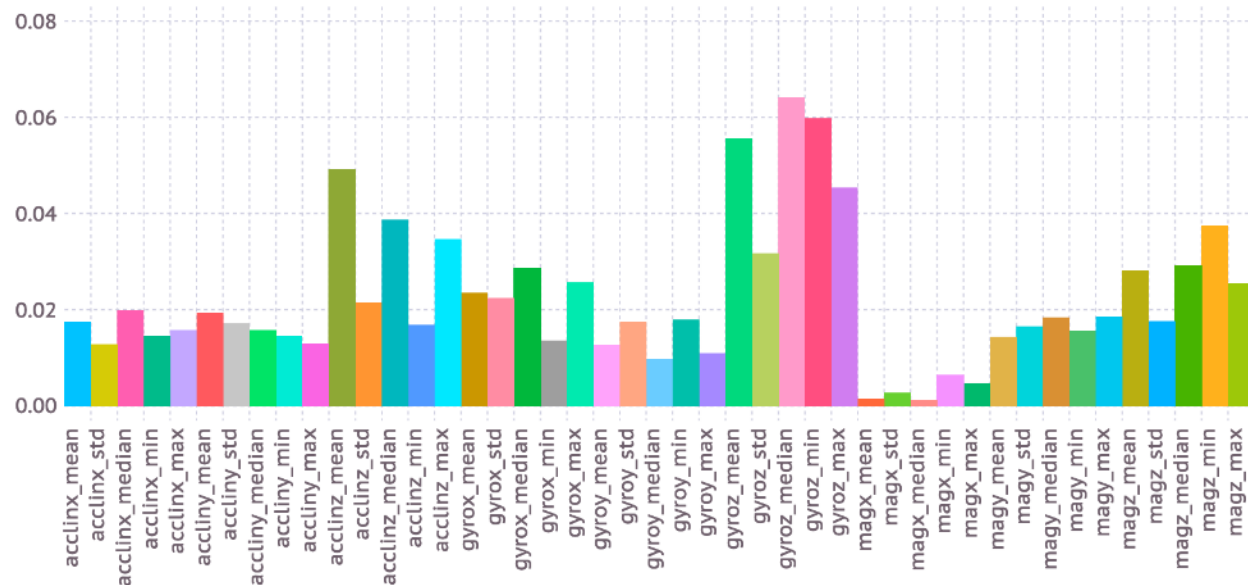
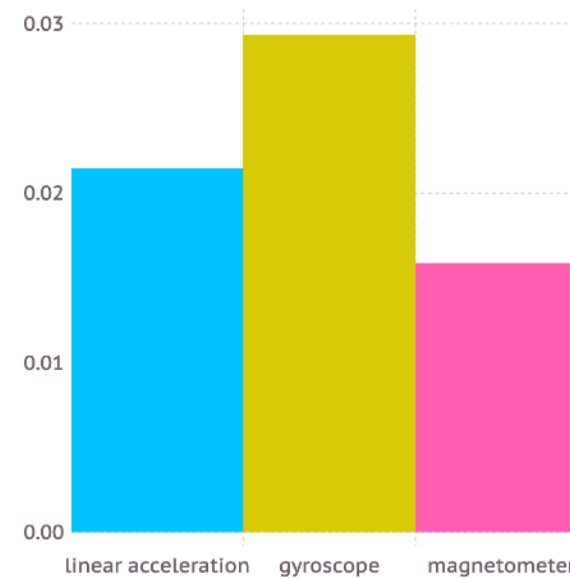


This model can operate in real time with less than 0.5 s delay

Main features

The sensors usefulness

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Possible improvements

1. Most of the errors come from "non-aggressive event" class which is confused with no event very often.
2. This class is ambiguous, should be more specific.
3. Many more labeled event examples are required to achieve results **around 99%**.
4. Model developement.



Thank you