



TOGETHER FOR  
**SAFER ROADS**

COMPANIES DRIVEN  
TO SAVE LIVES™

RoundTable

Use of technology and its impact on road safety

New York, June 14, 2016

# Star rating driver safety behavior by the use of smart technologies



George Yannis, Professor

National Technical University of Athens

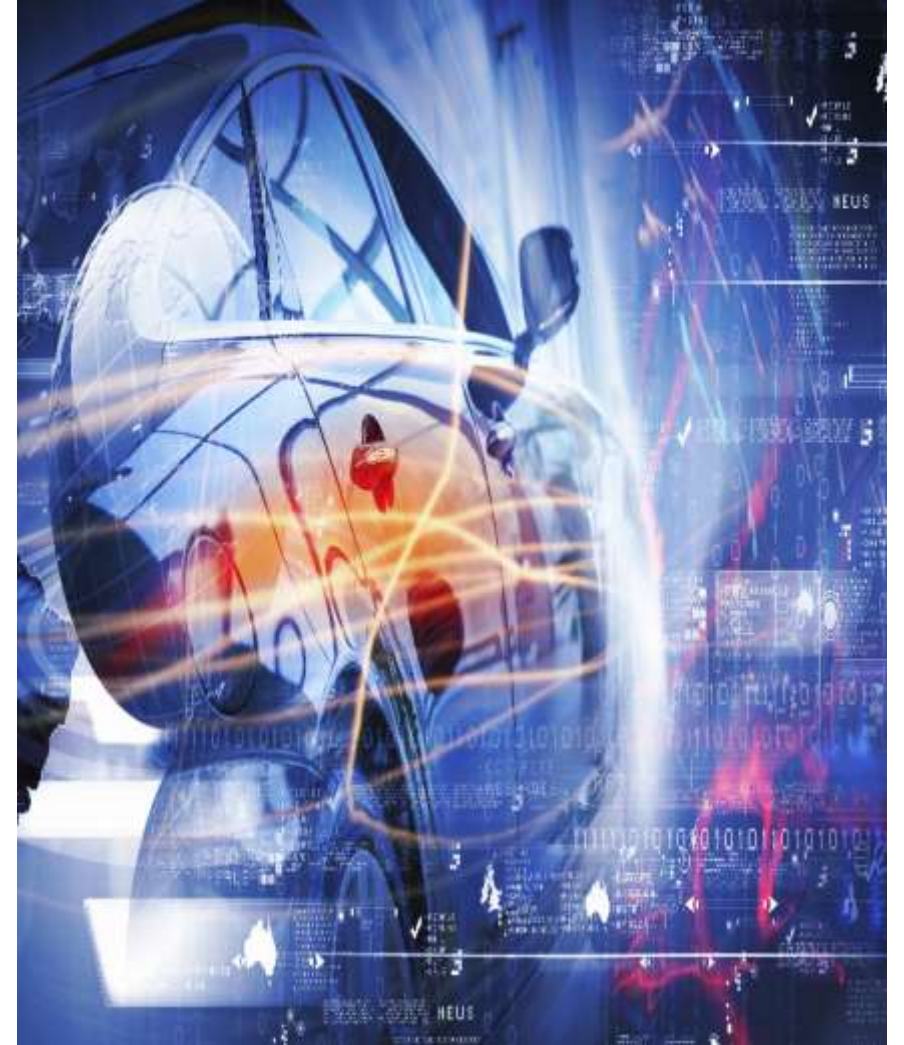
Department of Transportation Planning and Engineering

# Driver safety behaviour monitoring in the digital era

Current technological advances make data collection and exploitation substantially easier and more accurate than before due to:

- wide penetration of smartphones
- efficient transmission of large data sets (through GSM networks)
- powerful computing
- more insightful big data analysis

A new great potential arises for monitoring and star rating of driver safety behaviour, through the use of continuous data collection from the smartphone and the vehicle (On Board Diagnostics)



# Continuous driving data collection

## Smartphones

- the different sensors (GPS, gyroscope, accelerometer, compass, etc.) are exploited
- machine learning algorithms are developed to translate the data into useful metrics



## Vehicle On Board Diagnostics (OBD)

- an affordable and easily installed device through an existing plug in the vehicle
- collecting very detailed information on the status of the various vehicle subsystems



Data are automatically transmitted into a central database through the mobile network of a telecom provider





# Safety indicators of driver travel behaviour

- Total mileage and trips driven (risk exposure)
- Type and specific segments of the road network used (risky roads)
- Time of the day driving (risky hours)
- Hours driving (fatigue)
- Vehicle maintenance and safety performance (risky vehicles) (on-board diagnostics)

Driver data are combined with road network information (type of road, high risk sites, speed limits, traffic volume, traffic speed) using map matching algorithms



# Safety indicators of driving behaviour

- Speeding
  - driving over the speed limit
  - deviation from current average traffic speed
- Harsh braking
- Harsh acceleration
- Harsh cornering
  
- Distraction from mobile phone use (smartphone)
- Alcohol consumption (interlock devices)
- Seat belt use (on-board diagnostics)



# Safety star rating of travel and driving behaviour

All these highly spatially and time disaggregated data collected require:

- special machine learning algorithms
- powerful cloud computing
- high end data mining techniques
- efficient big data analytics
- scientific traffic safety analysis

in order to be translated into benchmarking and star rating of driver travel and driving behavior

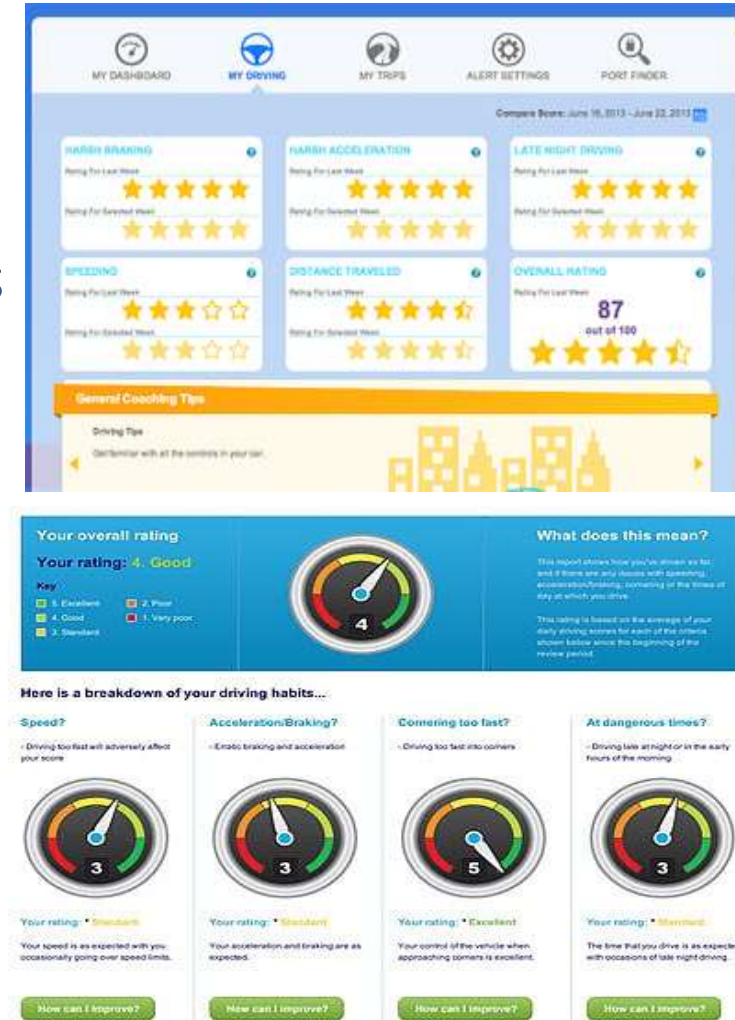




# Driver safety star rating and feedback

Driver safety behavior star rating is:

- produced through joint:
  - sophisticated **weighting** of the travel and driving behavior indicators
  - continuous **comparison** with all driver population monitored
- translated into overall and specific **scores** (e.g. scale of 0 to 100)
- communicated to the driver through **smartphone and web applications** providing:
  - information and monitoring on individual driving behaviour & risks
  - feedback and tips on driving aspects needing improvement
  - benchmarking among peers



# In Summary – Multi-purpose driving monitoring

The new applications of smartphones and other devices make gradually possible the continuous driver assessment, opening **a new great potential** for driver safety behaviour improvement:

- **independently by the drivers** in order to:
  - raise awareness and engagement on safe and environment friendly driving
  - provide feedback and support on driving performance and risks
- through **customized insurance schemes** by correlating travel and driving behaviour with insurance premiums:
  - pay-as-you-drive
  - pay-how-you-drive
- through the identification of **safety problems of the driver population** (and of the vehicle fleet) at the different road networks, allowing for the design of customized road safety policies





# Open challenges ahead

- Global penetration is easy, as no special prerequisites are needed, other than the smartphones
- Potential to extend this star rating of driver safety behavior:
  - to other road users (pedestrians, cyclists, motorcyclists, public transport passengers, bus and truck drivers)
  - for energy consumption and eco-driving monitoring
- More smart devices to use (smartwatches, smartglasses, etc.)
- Special attention is needed to rigorous scientific data processing and driver safety behavior modelling
- Personal data and privacy management issues need further attention





TOGETHER FOR  
**SAFER ROADS**

COMPANIES DRIVEN  
TO SAVE LIVES™

RoundTable

Use of technology and its impact on road safety

New York, June 14, 2016

# Star rating driver safety behavior by the use of smart technologies



George Yannis, Professor

National Technical University of Athens

Department of Transportation Planning and Engineering