



## *INTEGRATION BETWEEN ML/AI AND ENGINEERING*

SCIENZA E TECNOLOGIA PER LA VALORIZZAZIONE DELLE PMI

Giovedì 25 Febbraio, 2021

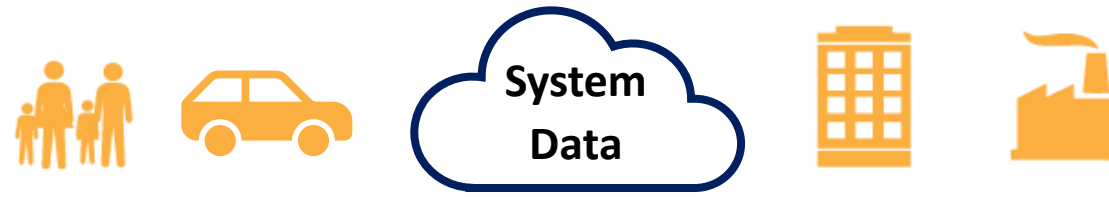


# Modelway's Data Driven Technologies

ML/AI Solutions for Modeling, Virtual Sensing, Control of Complex Systems



ML techs extracting key information from system data



Control Systems



STC®

(Self-Tuning Control)

Direct calibration from data

Virtual Sensing



DVS®

(Direct Virtual Sensors)

Estimate info unavailable on-board

Modeling



NOSEM®

(NONlinear SEt-membership Modeling)

Systematic model identification

## Features vs. Conventional Techs

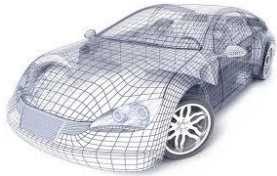
- 4x development time reduction
- Easy integration / tuning
- 3x accuracy improvement
- Low-cost solution

# Industrial Experience & Customers

Transversal innovation over different industrial sectors



## Automotive



- Pwt and Vehicle Dyn. control and diagnostic
- Autonomous Driving
- Predictive Maintenance



IVECO



BOSCH

YANMAR



FIAT CHRYSLER AUTOMOBILES



life.augmented



中国汽研  
CAERI

## Energy



- Energy control and optimization
- Gas emission Estimation
- Environmental variables estimation



## Factory 4.0



- In-Line Quality control
- Operator Safety
- Process KPI Estimation



# The SKIDLESS Project

Far too many lives are lost in car accidents every year despite technology innovations introduced in the last decades

## Key figures

- > 1 Million people die in the world for road crashes each year
- 1<sup>st</sup> causes of death for people Under 30 y/o
- Skidding Events are the leading cause of car crashes (40%)

*World Health Organisation Annual Report 2017*

*European Accident Research and Safety, Volvo Group 2018*

## Impactful Safety Technology

- Active safety technologies such as ESC and ELK have contributed to the reduction of fatal crashes
- However, they cannot detect all skidding events since they are missing a key variable: the Sideslip Angle (SA)

“These deaths are an unacceptable price to pay for mobility. There is no excuse for inaction”

Tedros Adhanom Ghebreyesus  
WHO Director-General

NO EXCUSE FOR INACTION



ESC

Electronic Stability Control



ELK

Emergency Lane Keeping

# The SKIDLESS Solution

**SA is the angle between the “actual” and the “intended” vehicle path and cannot be measured on production cars. MW has developed a solution for real-time estimate of SA**

## Issue

- SA cannot be measured on production cars
- ESC and ELK are based on the vehicle angular rate measurement

## Challenge

- Real-Time estimate of the actual SA
- Low cost solution integrated in the vehicle

## Solution

- Direct Virtual Sensing (DVS<sup>®</sup>) proprietary technology for vehicle SA estimate
- Based on advanced Machine Learning techniques to produce a reliable and robust estimate

**First application ever of a SA estimator on board a series production vehicle has been developed by Modelway**



Demonstrated with



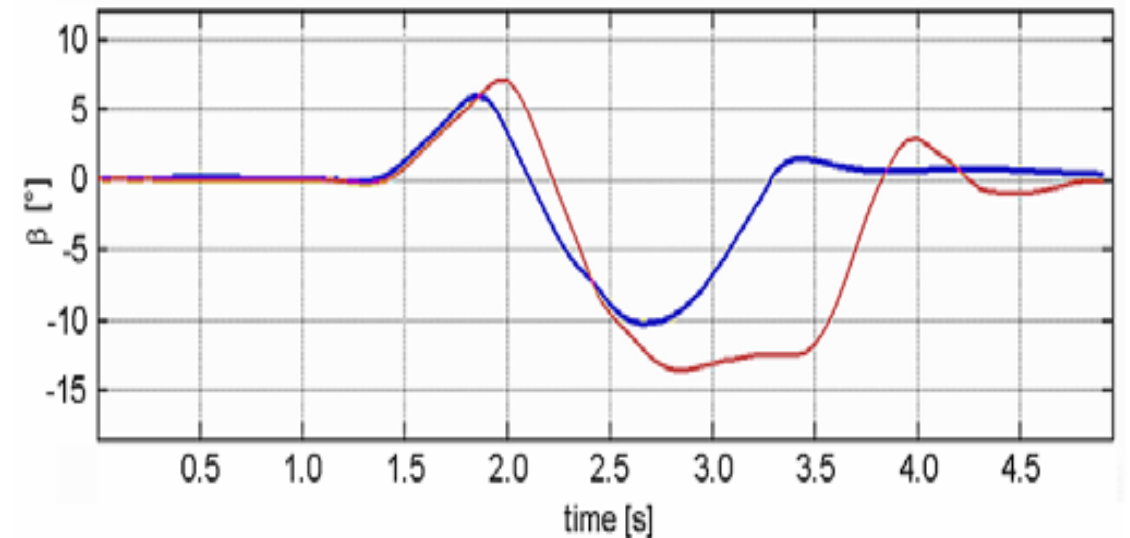
# The SKIDLESS Solution

**Skidless is a highly innovative solution providing untapped benefits for the mobility sector and the overall society**

## Customers and societal benefits

- **20% improvement** in skidding events prevention
- **+20% ESC efficiency in avoiding obstacles**
- Reliable estimation in **variable operating conditions** (dry/wet road, tyre wear, vehicle load)
- **Enabling factor** of autonomous driving
- **Potentially 100,000 lives saved every year**  
**(i.e societal value of 150 Bn€)**

*European Commission - Recommended Values for the Value of Preventing a Fatality*



Measured  $\beta$  in collision avoidance maneuver w/ (blue) and w/o sideslip angle control (red)

# Kitenav project

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[www.kitenergy.net](http://www.kitenergy.net)



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