

Matching between **Artificial Intelligence** and **Engineering**

**How SMEs can Support Corporates in R&D
and Time to Market Improvement**

Ilario Gerlero – Manager & Shareholder

Club Dirigenti Tecnici - Le PMI si raccontano - 13 luglio 2020

The Company

Technological Transfer from University to Industry



Who we are

- Founded as Spinoff of Politecnico di Torino by professors expert in complex systems
- Company developing industrial innovation based on Machine Learning and Big Data
- Proprietary technologies covered by international patents

Awards & Founding

2019



Seal of Excellence - SKIDLESS project
Enhancing vehicle's safety through the Virtual Sensor for skidding estimation

2018



EU Mobility & Industry Venture Forum 2018
Finalist with Data Driven sw sensors for vehicles On-Board Information improvement

2018



ELECTROLUX Innovation Day
Finalist with Data Driven solution to improve appliance performances

2014

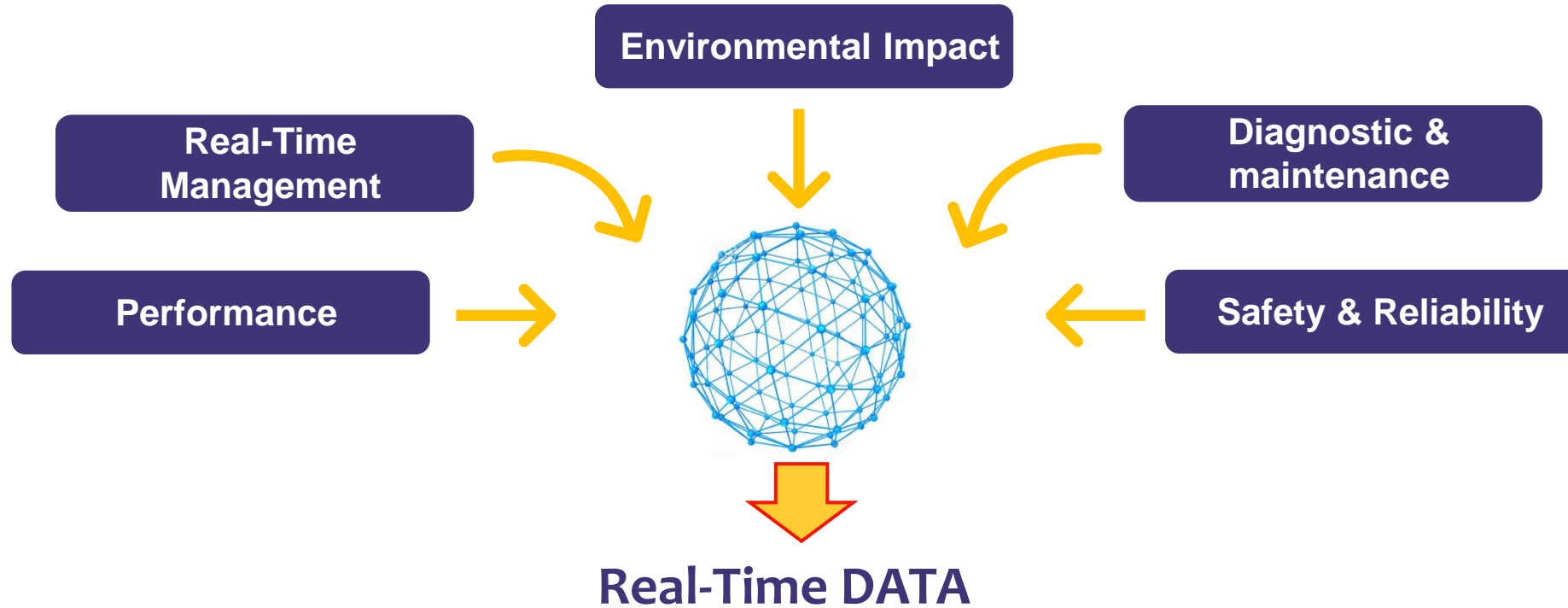


IEEE Control System Society Award
To Prof. Mario Milanese for the contribution in systems identification and control

Innovation Needs Information

Exploit Data to Improve Decision Support Systems

Data are essential to face the present technological challenges



Data-Driven technologies as enabling factor for:

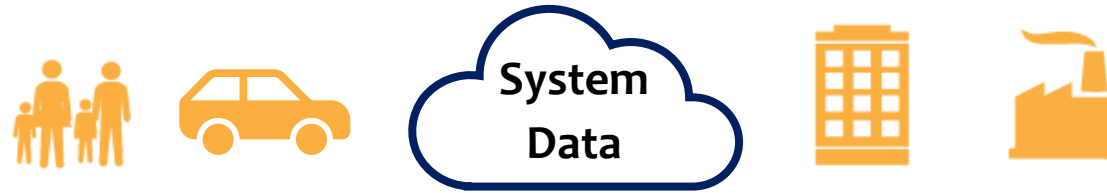
Control – Diagnostic - Prediction

Modelway's Data Driven Technologies

Solutions for Control, Diagnostic and Prediction



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

Business Proposition

We provide customized solution and products

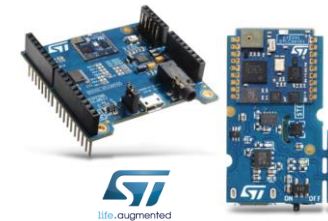
Solutions to be integrated in the customer value chain

SW SOLUTIONS in Data-Driven Innovation

- Predictive maintenance applications
- Advanced Data-Driven controls
- Advanced real-time diagnostic
- Plant / environment key parameter estimate

HW / SW PRODUCTS for Edge Computing applications

- Software tools / platforms
- Plug / play devices

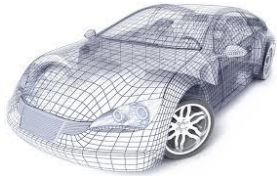


Industrial Experience & Customers

Transversal innovation over different industrial sectors



Automotive



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



IVECO



BOSCH

YANMAR



Energy



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



Factory 4.0



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

altran



SKF



TRENORD

On-Board Diagnostic

Virtual Sensors to Estimate Critical Measurement Fri

Improvement in Vehicle Dynamic Performance and Safety

Problem

- Real-Time Sideslip Angle (SA) estimate is currently not available on production cars;
- It is a critical parameter for vehicle dynamics that can dramatically improve vehicle's performance and safety;

Solution

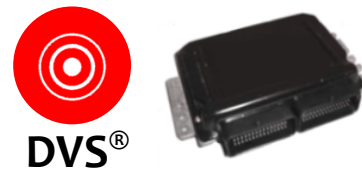
- Modelway has developed a data-driven solution that provides an accurate estimate of the SA;
- The Direct Virtual Sensor for the SA estimation is presently industrially embedded in three supercar models

Working Principle

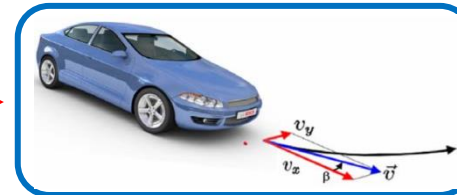
Real-time vehicle data

- Acceleration
- Wheels speed
- Steer wheel angle
- ...

On-board SA estimation



Improved vehicle ESC



Technology

DVS[®]



Direct Virtual Sensors

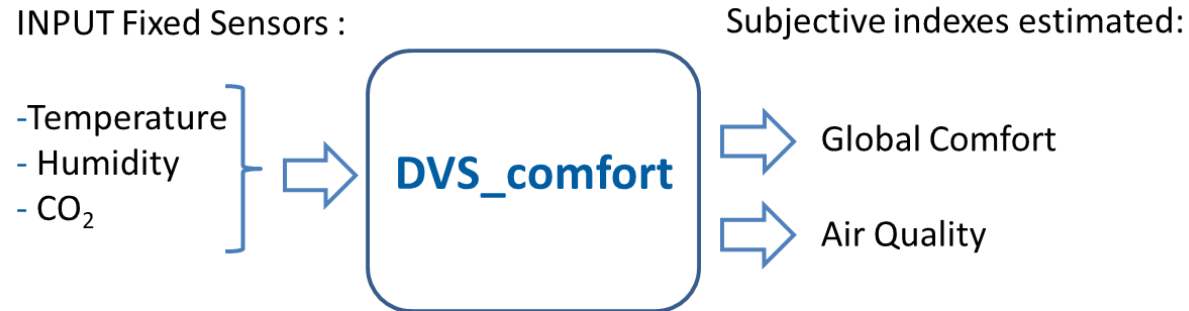
Software sensors for real-time system or plant diagnostic

Virtual Sensors for real time diagnostic and monitoring

Problem

- Some critical variables are difficult to be modeled or measured
- Some examples can be:
 - Human behavior / feeling
 - Gas emissions
 - Environmental variables
 - Critical process KPI

Solution



Technology

DVS[®]



Outcomes

- **Substitution / recovery** of costly physical sensors;
- **Easy integration** in existing Ict platform;
- Real time **availability of laboratory info**;
- **Low cost** redundancy for mission critical measures

Data Driven Modeling & Control

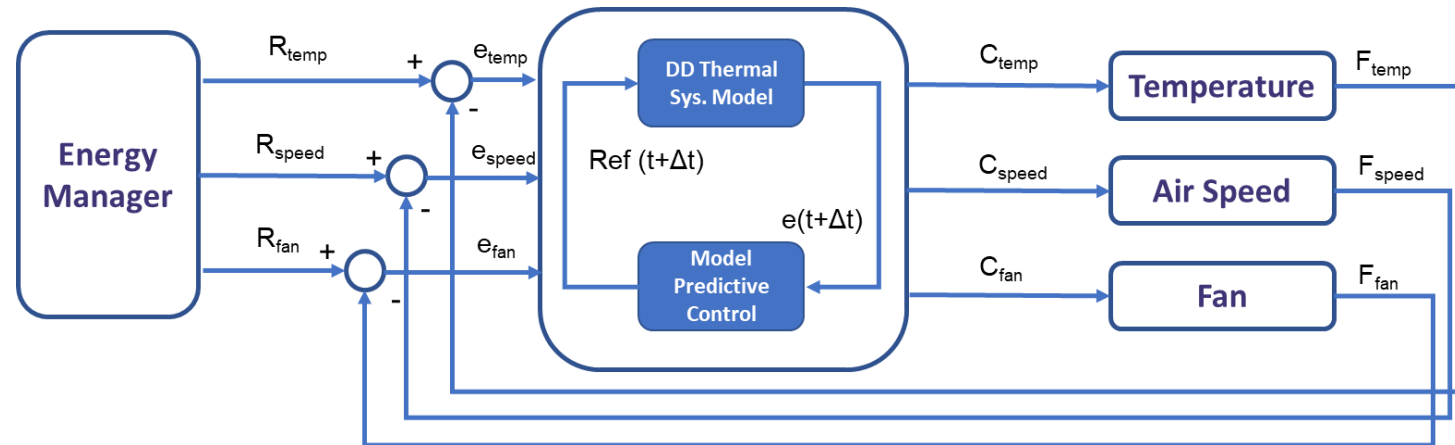
Real-time control of complex processes / plants using experimental data

Real-Time optimization of the HVAC system control

Problem

- A thermal system is complex to be modeled and controlled;
- System controls are tuned by the experience, but could be not optimal in the whole working range;

Solution



Outcomes

- **Accurate modeling** of the thermal system using the actual experimental data;
- **Predictive Control** performs a real-time HVAC optimization, based on the actual working conditions;
- **Energy savings** higher than 20%;

Technology

STC[®]



Workers Safety Monitoring

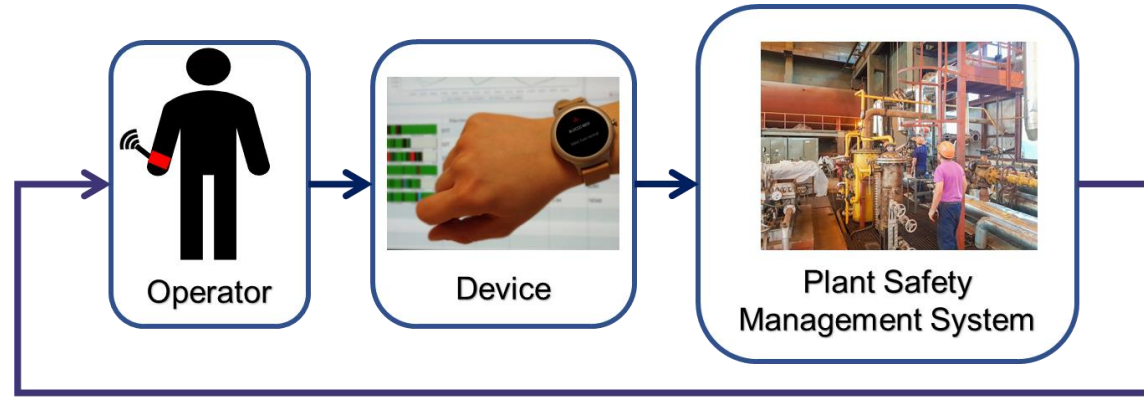
Wearable product for workers operating in isolated environments

An innovative product to monitor the operator safety

Problem

- To monitor the safety of operators working in insolated or dangerous environments;
- Industrial compliance and robustness
- Information accuracy

Solution



Plant Communication Protocol

Technology

DVS®



Proprieties



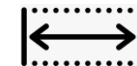
Integration with Smartphone



Geo-localization



Vibrating Alert



Proximity Detection



ATEX compliant



Access Control



Man Down Detection



Microphone



Running and specific gesture detection



OTA recalibration

Predictive Maintenance

Predict critical system behaviors from experimental data

Real-time train's anomaly detection and prediction

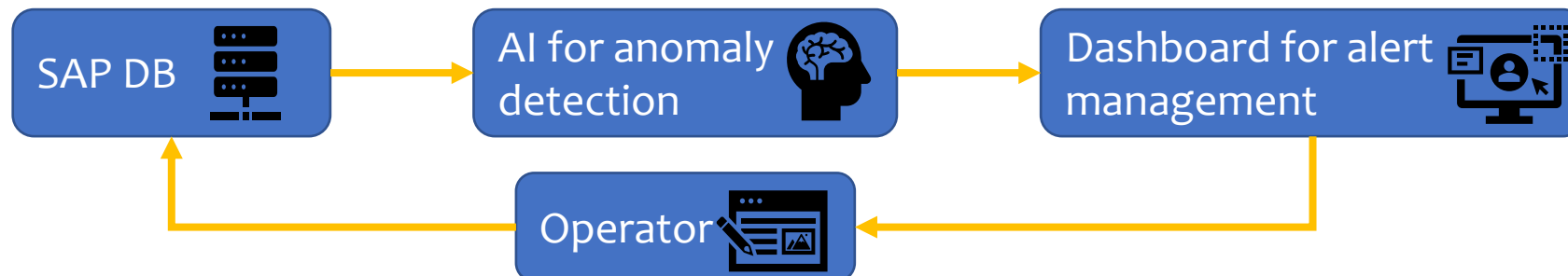
Problem

- Anomaly and fault detection from historical maintenance datasets;
- Any retrofitting from vehicles is present;
- The Predictive Maintenance system have to be integrated with SAP

Solution

- AI algorithms can recognize anomaly patterns from the historical maintenance data in SAP;
- When the anomaly is detected, an alert for the operator is generated through a dashboard running in cloud;

Working Principle



DVS®





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