Politecnico di Torino
Dipartimento di Automatica e Informatica

PhD in Computer and Control Engineering
XXXVI cycle

GRAINS
GRAphics and INtelligent Systems group

Supervisor
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Multivariate Analysis in Research and Industrial Environments

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1. Introduction and Goal

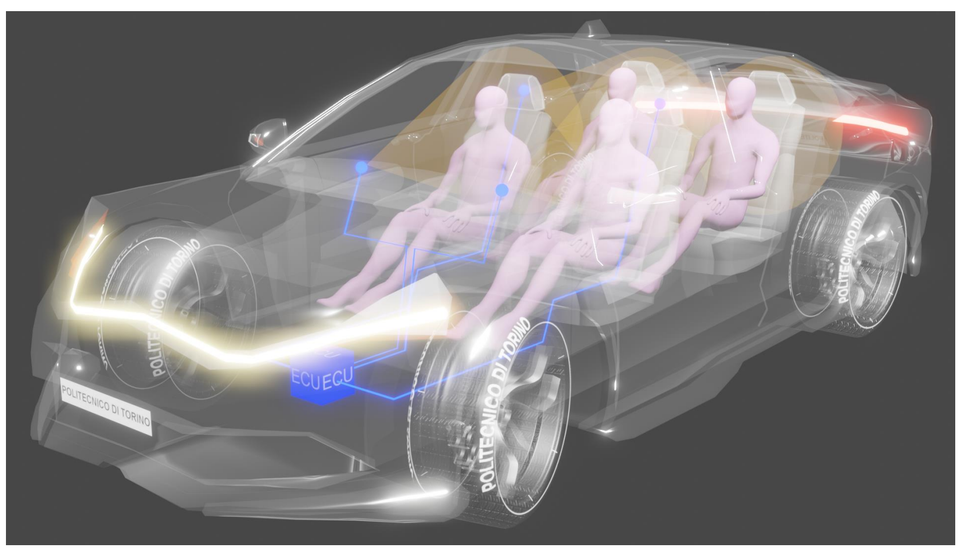
A sensor is a device capable of responding, indicating, or recording physical phenomena after their detection or measurement. Different types vary according to their intrinsic characteristics, the measurement method, the characteristics of the subject to be measured, and the applications of interest. The measured data may contain hidden links between the same data, which can often be best understood through their visualization. Hence, the main research goal of my Ph.D. is to study and understand such sensory data.

2. Methods and Results

This section briefly summarizes both the types of sensors examined so far and the projects they are involved in.

2.1. Camera and Photodiode Sensors

Camera sensors were involved in three different research projects. The first concerned the study of techniques to improve the social acceptance of Automated Driving System (ADS) equipped vehicles [1]. The second regarded the improvement of mask detection systems [2]. The last involved a joint use with photodiodes and consisted in the use of facial expressions and biological signals to detect the level of attention of students in a classroom [3].



2.2. Fiber Bragg Grating Sensors

Fiber Bragg grating sensors are used in the PhotoNext project, carried out in collaboration with DIMEAS. They were mounted on a model aircraft of the Icarus team called Anubi to measure strain and temperature information and display them simply and immediately.

2.3. SCADA Systems

Data from SCADA systems are under study in several wind turbine projects. They are made in collaboration with Sirius s.r.l. and concern fault detection, performance analysis, and digital twin creation.

3. Conclusions

During the Ph.D. the use of sensors for different purposes was analyzed. This work will continue during the next academic year.

4. References

1. **A. C. Marceddu** et al., "A novel approach to improve the social acceptance of autonomous driving vehicles by recognizing the emotions of passengers" in Thirteenth International Conference on Machine Vision (ICMV), vol. 11605, pp. 503-510, 2021.
2. **A. C. Marceddu** and B. Montrucchio, "Recognizing the Type of Mask or Respirator Worn Through a CNN Trained with a Novel Database," 2021 IEEE 45th Annual Computers, Software, and Applications Conference (COMPSAC), 2021, pp. 1490-1495.
3. **A. C. Marceddu** et al., "A Novel Redundant Validation IoT System for Affective Learning Based on Facial Expressions and Biological Signals" Sensors, vol. 22, no. 7, 2773, 2022.