

Deep Learning Based Approach for User Monitoring in Autonomous Driving

New car technologies and infrastructures influence the driver and as well the passenger behavior. Technologies like autonomous driving or assisted driving allows the driver to focus on other activities. That means, the modern cars should support this activities and react, through actuators, on the user status, as his/her mood or health conditions.

Furthermore, modern cars can allow an observation of the drivers by monitoring specific health data from several sensors.

Additionally, wearables are becoming common in users life. They are constantly monitoring user activities, vital signals and providing immediate feedback to the users. These devices can offer important information about users that can be used to different purposes when connected to other systems or devices.

A set of physical devices that interact with a virtual cyberspace through communication networks is the base idea of Cyber Physical Systems. The CPS is a new generation of systems which integrates physical and computational capabilities that interacts with humans through Human Machine Interfaces. The ability of interacting, expanding functionalities, and even

learning new capabilities is one key component of this new generation of devices integration. These devices compose the edges of the Internet of Things.

The Internet of Things works as a bridge connecting physical devices to cyber space and it has introduced new kind applications, where it is possible to integrate many data sources, actuators and people. These applications required cloud infrastructures to support a huge amount of data and the ability to process that data. However, not all applications are all the time connected or they have time constraints to be respected, as for example in the automotive area. With this kind of applications, the idea of Computing on the Edge plays one important role in the system, where it is possible to have processing power embedded on devices that can provide answers respecting deadlines.

By combining and analyzing all this data with Deep Learning algorithms, a modern car is able to identify drivers and/or passengers health status, as well as the mood and then improve the driver/passenger experience. The main idea of this project is to setup an adaptable service architecture middleware to allow sensor fusion and integration of Deep Learning algorithms,

that is able support the previously mentioned car services. The proposed architecture must support both edge as cloud based approach based on the requirements of this kind of systems.

With this approach, systems can offer both new functionalities for users inside of a car as well as new safety mechanisms for autonomous cars where may need users help in some situations.