Head-Up Display (HUD) systems can project crucial information on the windshield, using augmented digital input to enhance the real environment. The presented data can provide notification of road markings, the proximity of neighbouring vehicles’ and warnings of traffic congestion to enhance human responses and improve driving safety.

At Glasgow Caledonian University (GCU), experts in our Visual, Affective and Pervasive Systems Research Group (VAPS) are researching preventative collision avoidance HUD systems through virtual reality driving simulation.

The Visual, Affective and Pervasive Systems Research Group is led by Dr Vassilis Charissis, an award-winning computing design engineer who has participated in multiple commercial and academic projects investigating Human-Computer Interaction (HCI) as well as acting as a 3D and VR visualisation specialist for vehicles (Ford, Suzuki), ships (QinetiQ, Fisher Defence, Singapore Marine Technologies), buildings (Glasgow City Model), defence (Thales, QinetiQ), medical (RCSEd, RCSPG, NES, ARUK), and mechanical engineering explanatory simulations. Research interests focus on the Human-Computer Interaction (HCI), design and evaluation of Head-Up Display (HUD) Interfaces, driving simulator development, driver behaviour, concept product design, 3D visualisation, Virtual Prototyping, and Human Factors engineering.
Dr Charissis is working with colleagues from University of Glasgow and Nottingham Trent University to develop a functional virtual reality driving simulator and test different interfaces to project vital information on the car windscreen, whilst retaining virtual reality depth of field.

The team analysed extensively the roads and traffic between Glasgow, Edinburgh and Stirling in order to simulate ‘real-life’ driving scenarios, complete with road signage, buildings, landmarks and vegetation. A photorealistic 3D model of BMW 5 Series car has been developed for accommodating the HUD interface and enhancing the realism of the simulation. The driving simulator allows the user to drive in clear conditions and thick fog, clearly illustrating the requirement for HUD interfaces to display information which the driver no longer has access to when driving ‘blind’. The team is currently conducting user trials in order to evaluate the efficiency of the proposed HUD interface.

Dr Charissis’ previous work has proved the efficiency of earlier versions of the novel HUD interface in various adverse weather conditions, where the system improved the collision avoidance rate significantly. As such, the improved HUD has the potential to be used as an intelligent transportation system within emergency services vehicles as well as civilian vehicles used under low visibility conditions. The Visual, Affective and Pervasive Systems Research Group is focused on immersive mixed reality, pervasive and mobile computing systems in domains such as automotive, medicine, games, entertainment, tourism, energy and the built and natural environment. Virtual Reality simulation and 3D visualisation are extremely effective means of bringing complex ideas and conditions to life and have ever-expanding applications in science, education, health and engineering fields. The group has developed a unique Virtual Reality and Simulation laboratory (VRS Lab) at Glasgow Caledonian University to explore creative and novel uses of advanced 3D digital visualisation and interaction technologies. The lab can be used for investigating new groundbreaking methods for maximising the usability of HUD interfaces with the use of real-time information streaming through Vehicular Ad-hoc Network systems (VANETs) and developing Virtual Reality, 3D and HCI models for Building Information Modelling, oil and gas, health and safety and healthcare training amongst others.