

# COMPUTER AND CONTROL ENGINEERING

## MUR DM 117/Italdesign - Design of an integrated system for testing headlamp optical functionalities.

<b>Funded By</b>	ITALDESIGN GIUGIARO S.P.A. [P.iva/CF:08555070013] MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]
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<b>Context of the research activity</b>	<p>Automobile recent development, including autonomous driving systems, are based on several sensors such as cameras, radars, and others. These sensors are used not only for managing driving, but also for improving road illumination.</p> <p>This proposal is related to more sophisticated types of automotive lighting, in collaboration with Italdesign S.p.A. The purpose of the work will be to design new automatic systems for managing illumination; computer vision algorithms and image processing methods.</p> <p>Progetto finanziato nell'ambito del PNRR – DM 117/2023 - CUP E14D23002020004</p>
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	<p>Automobile evolution requires increasingly automatic systems for driving and traffic detection, for example of other cars or bicycles or other vehicles. Therefore, also lighting systems are in fast evolution. In particular future vehicles' headlamps will move towards several light sources independently driven, up to several thousand of different sources, each of them driven by means of a technology similar to the one used in digital micromirror projectors. The final purpose is to develop a headlamp able to move automatically the light on obstacles like pedestrian on bicycles suddenly appeared on the road. In order to find where to move the light all the sensors available in the car can be used, mainly cameras and radars.</p> <p>This PhD aim of the activity is the development of the already existent system up to a higher complexity level that allows measurements on matrix high beam functionalities in function of different road and car simulated configurations.</p> <p>The proposal puts together competences of Dipartimento di Automatica e Informatica and industrial strong knowledge of Italdesign S.p.A.. Therefore experimental activities, also in the foreign sites on the company, mainly in</p>
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**Objectives**

Germany, will be performed.

This work will be developed during the three years, following the usual Ph.D program:

- first year, improvement of the basic knowledge about lighting systems, attendance of most of the required courses, also on applied optics, submission of at least one conference paper

- second year, design and implementation of new algorithms for testing headlamp optical functionalities and submission of conference papers and at least one journal

- third year, finalization of the work, with at least a selected journal publication.

Possible venues for publication will be, if possible, journals and conferences related to computer vision and optics, from IEEE, ACM and SPIE. An example could be the IEEE Transactions on Image Processing.

The scholarship, funded at 50% by Italdesign S.p.A, follows DM 117 (2 March 2023). A period of six months abroad will be done during the PhD, and a period of at least six months in Italdesign will be mandatory too.

The work will therefore be done in strict collaboration together with Italdesign Giugiaro S.p.A, with whom there is already a collaboration.

**Skills and competencies for the development of the activity**

The ideal candidate should have an interest in optics, computer vision, and image processing.

The candidate should also have a good background in programming skills, mainly in Python. Good teamwork skills will be very important, since the work will require to be integrated with company work.