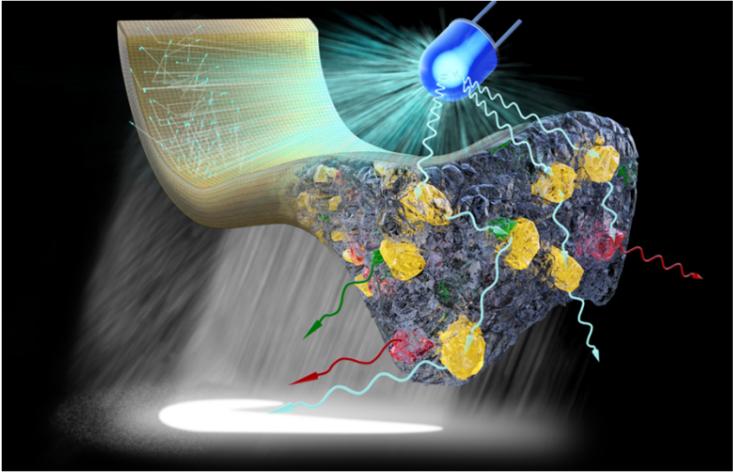


# MASTER THESIS PROJECT: RAY TRACING FOR FREE FORM OPTICS



*Driven by the new opportunities delivered by 3D printing, free form optics has recently grown into a significant research field. With the development of new generation of Graphic Cards with Ray tracing engine, it is clear that new methods to find and optimized reflective surface for pattern illumination can be developed. In this project we aim to create a unique combination of optimization algorithm and ray tracing code to achieve quick and efficient optical solution for Free Form Optics.*

## WHO ARE WE?

As part of the Optics Research Group, we conduct world leading Optical research. Our expertise in optics and imaging allows us to study solutions for real case problems for the industry.

We provide an enthusiastic and international working environment where students participate actively in research. We encourage participation in conferences and we actively publish in international journals.

For this project, we are working in collaboration with many partners, within TUDelft (Mathematics/computer science) and outside (Tweente, TUE) as well as **industrial partners** (TNO, Schott, Lumileds, Philips).

## DESCRIPTION OF THE PROJECT

Problem of illumination are very diverse within our industrial partners. But they all describe a source (single or extended) and a pattern to obtain on a specific surface. For example to design a collimator that gather the light from a plasma source towards the entrance of an optical system; another would be to find a proper surface design for a light source made of multiple LEDs to illuminate efficiently the roads at night.

In this project, we would like to implement ray tracing to the new generation of GPU, in order to generate thousands of designs for the free form reflector/lens (shape and position), where the light source and the expected surface for is known.

With the built database, choice of smart algorithm has to be made, in order to obtain a desired illumination on the surface. We believe that genetic algorithm or possibly neural networks are possible. The results would be compared with other method such as solving the Monge Ampere equation related to the problem.

## WHAT YOU WILL DO

In a short introductory period, you will learn the basic principles of ray tracing and free form optics algorithm. Through the project you will:

- Develop a ray tracing code for new generation of GPU.
- Study real case scenario and built a database of illumination patterns obtained for different optics.
- Built an algorithm to find the best solution to the problem
- Work in an interdisciplinary team;
- Report on research findings.

## INTERESTED?

Please contact Dr. Aurèle Adam from Optics or Dr. Ricardo Guerra Marroquim from EEMCS Dept. Intelligent Systems.

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