The main objective of this PhD is two-fold: understand how 3D shape and material are efficiently communicated using clever lighting designs; and develop new tools to semi-automatically control lighting in synthetic 3D scenes. The developed methods may be static (as in product or environment design) or dynamic (as in performance or interactive applications).
or dynamic (as with visual effects and games), and possibly constrained (as in museography or theater). Depending on the final application, the results may be non-physical to some extent, or predictable if they are to be reproduced with real-world lighting.

In contrast to previous work, the goal of the thesis is to provide explanatory models that both rely on the physics of the imaging process and its perception by the human visual system.

The method we would like to pursue is organized in two stages: first establish relationships between image properties, and properties of shape and materials in a 3D scene; second, provide tools that assist artists in producing lighting environments that exploit these relationships to best convey shape and materials in rendered images. We took that approach in previous work in the restricted context of objects made of anisotropic materials (e.g., brushed metals) lit by a single directional light source [6]. We made use of a differential analysis of image formation to establish image-scene relationships, and optimization to automatically find the lighting direction that produces highlights of a desired shape on a given 3D object.

In this thesis, we intend to go farther by considering a much wider class of materials (plastics, metals, matte, skin, etc), by analyzing larger surface regions, and by expressing the result of the analysis in 3D space so that it may be used to directly guide artists in the lighting design task. We prefer such a computer-assisted approach over a fully automatic one as lighting design solutions may vary depending on the target application and artist's style. This variability is precisely what makes lighting design a difficult endeavor, and computer assistance a promising improvement. Validation will likely require to work with colleagues in Human Vision such as Sylvia Pont from TU Delft, with whom we have an ongoing collaboration on the topic.


Principales activités
- Perform bibliographic study
- Develop a prototype application
- Write research papers
- Present at conferences

Compétences
The successful post-doc candidate should have taken courses in Computer Graphics and/or Computer Vision, and have a good experience in C++ programming. An experience in either sketch-based techniques or expressive rendering is required.

Languages:
French or English

Avantages
- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage
Rémunération

1982€ / month (before taxes) during the first 2 years, 2085€ / month (before taxes) during the third year.