MASTER IN PHOTONICS – PHOTONICS BCN
EUROPHOTONICS-POESII MASTER COURSE

PROPOSAL FOR A MASTER THESIS

Starting full time from April 2024
Presentation at the end of July or beginning of September 2024

Laboratory: Center for Sensors, Instruments and Systems Development (CD6)
Institution: Universitat Politècnica de Catalunya
City, Country: Terrassa

Title of the master thesis: Machine learning for subjective refraction prediction from accommodative response data

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Keywords: accommodation, refraction, machine learning.

Summary of the subject:

Subjective refraction is a common task in the clinical practice of optician to quantify and correct myopia and other refractive errors (hyperopia, astigmatism, and presbyopia) that may affect the eye. The goal of this procedure is to find the combination of lenses that provides the best vision in patients in the absence of accommodation (capacity of the eye to focus objects at different distances). Sometimes, mainly in children and young adults, accommodation is involuntary activated without being noticed. When this occurs, the refractive error might be incorrectly quantified and, consequently, wrongly corrected.

A compact system that allows monitoring accommodation during the subjective refraction has been developed in the Centre for Sensors, Instruments and Systems Development (CD6). The implemented prototype, which is based on a Hartmann-Shack aberrometer and works coupled to a phoropter, has been used to successfully obtain the accommodation response for the subjective refraction in patients with accommodation capacity. Our final goal is to develop a system that could be used as a supporting tool

providing information about the true state of accommodation in those clinical procedures in which accommodation plays an important role.

In this Master thesis, the accommodation response provided by the system will be related to the subjective refraction and analysed using machine learning techniques. Concretely, it will consist in studying which are the best metrics related to the accommodation response and in the research and application of this data to non-linear machine learning methods that can provide good estimations of the subjective refraction.

Additional information:

It is desirable that the student has the following knowledge/skills in :

1. Data processing.
2. Use of Matlab and Python.