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Master in Photonics – “PHOTONICS BCN” Master ERASMUS Mundus “EuroPhotonics”

MASTER THESIS PROPOSAL

Dates: April 2021 - September 2022

Laboratory: Centre for Sensors, Instruments and Systems Development (CD6)

Institution: Universitat Politècnica de Catalunya (UPC)

City, Country: Terrassa, Spain

Title of the master thesis: *Eye tracking technology for diagnosis of neurological disorders.*

Name of the master thesis supervisor: **Mikel Aldaba, Meritxell Vilaseca**

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Keywords: photonics, eye tracking, eye movements, neurological disorders.

Summary of the subject (maximum 1 page):

Persistent COVID-19, which causes neurological sequelae, is presented as the great challenge for the medical and scientific community in the medium term. One of the greatest challenges in this regard will be the development of new diagnostic techniques for these sequelae, since the current ones are expensive and invasive. For this, techniques related to the visual system are of special interest, since this can be considered an open window to the human central nervous system. The techniques that study eye movements are of special interest, since they are known to be affected in neurological disorders. In this context, a multidisciplinary team from the UPC and the Terrassa Health Consortium is working with the aim of developing diagnostic tools for neurological disorders in patients with persistent COVID-19 based on eye movement records. To date, there is a system to present stimuli to the patients in order to induce eye movements and record them. Moreover, the work team has already done some measurements in patients. However, the system requires from improvements in two main aspects: migrating to a new eye tracking system suitable to be used in clinical practice and the development of data processing algorithms. For this purpose, we look for a motivated and enthusiastic student with good team working skills.



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The main points that will be carried out by the student during the completion of the M.Sc. thesis are the following ones:

1. Look for bibliographic information to be able to offer more ideas in the system design.
2. Implement the current system for the recording of eye movements in a new eye tracker.
3. Implementation of data processing algorithms to extract characteristic patterns of the eye movements from the dataset.
4. Seek the possibility of using machine or deep learning for the data processing.
5. Statistical analysis of the data.
6. Participate in experimental measurements of the systems.
7. Discuss the results with other works in the state of the art for similar image datasets.

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

1. Python and Matlab programming.
2. Machine and Deep learning background.
3. Image processing.
4. Clinical research.