

International PhD offer in physics for ophthalmology

Clinical use of full field optical coherence tomography

Full field optical coherence tomography (FFOCT) is a technology developed in Paris by Kate Grieve's team which allows cellular level resolution for retinal imaging in the living human eye, in a compact low-cost setup without the need for a complex adaptive optics path. Two prototypes are currently being used in clinical study at the 15-20 Hospital in Paris. The current project aims to transfer this novel technology outside of France for the first time, to the University of Pittsburgh. The equipment is currently being installed, and this project will allow a PhD student to carry out a research project which involves patient imaging with FFOCT, searching for the pertinent clinical biomarkers made accessible by this new technology. It offers the opportunity to diffuse a promising technology within the unique environment formed by the Kate Grieve and Ethan Rossi labs' parallel high resolution retinal imaging facilities for patient diagnostics and follow-up. The student will benefit from the existing close collaboration of the two teams to develop and enhance multimodal image validation protocols and image analysis methods in order to evaluate the added value of the new technology in improving patient care.

Research project scientific context

Over the past 30 years, two major revolutions in retinal imaging have allowed the resolution of retinal layers, with optical coherence tomography (OCT), then retinal cells, with adaptive optics (AO).

Among the world leaders in the use of OCT and AO, the Grieve and Rossi teams have strived over recent years to create parallel high resolution imaging facilities for patient imaging with novel technologies including adaptive optics and optical coherence tomography, where they have been able to successfully carry out bi-centric clinical imaging projects on patient cohorts. They have current or recent funding seeking to detect novel micrometric biomarkers of age-related macular degeneration (AMD) and retinitis pigmentosa (RP) using state of the art technologies. Their labs have access to a rare collection of unique equipment, and at the same time, access to rare cohorts of patients with ophthalmic disease, some of whom are undergoing new therapies such as gene and cell therapies.

One technology recently developed into a clinical prototype in Paris is full field optical coherence tomography (FFOCT). Two prototypes are being tested in Paris, and a third is currently being installed in Pittsburgh. This new technology gives unprecedented 3D micrometric resolution in a compact OCT device, potentially providing similar or



greater detail to adaptive optics devices in a less complex, lower cost setup.

Objectives

The project proposed seeks to recruit a PhD student, with an ophthalmology and/or optics and/or image processing background, fluent in English, who will bridge the work at the two sites on the early use of this new technique on healthy volunteers and patients, with the following objectives :

- 1- Generate data with the new device at both sites ;
- 2- Validate the new technology against the gold standard(s) of retinal imaging at cellular resolution, i.e. adaptive optics and OCT technologies ;
- 3- Develop software and image analysis protocols to extract novel micrometric biomarkers of retinal disease from the FFOCT images generated in the various cohorts being followed at the two sites. This will include a search for photoreceptor, nerve fiber, vascular and immune biomarkers.

Job contract and terms

Temporary contract of 3 years

Job locations

France : Kate Grieve Team - The Vision Institute, 17 Rue Moreau, 75012 Paris

USA : Ethan Rossi Lab - University of Pittsburgh, 203 Lothrop St. Suite 834, PA 15213

USA

Recruitment methods

Deadline for applications: June, 30th, 2023

Start of contract : earliest October, 1st, 2023

The contact for your application (cover letter, CV) is Kate Grieve
(kate.grieve@inserm.fr)