China Scholarship Council – University Maastricht

PhD Programme Application form 2024

Basic information

- To be filled in by the prospective UM supervisors -

1. Information on prospective UM supervisors and Promotor

1a. First Supervisor/promoter:

Dr. T.T.J.M. Berendschot
University Eye Clinic Maastricht, Maastricht University
PO Box 5800, 6202 AZ Maastricht, the Netherlands
t.berendschot@maastrichtuniversity.nl

1b. Second Supervisor/copromoter:

Dr. F. van Asten
University Eye Clinic Maastricht, Maastricht University
PO Box 5800, 6202 AZ Maastricht, the Netherlands
freekje.van.asten@mumc.nl

1c. Promotor:

Prof. dr. C.A.B. Webers
University Eye Clinic Maastricht, Maastricht University
PO Box 5800, 6202 AZ Maastricht, the Netherlands
c.webers@mumc.nl

2. Information on UM Faculty/ Department/ Institute/ School contact person:
When the application is granted by both the CSC and UM, the contact person is responsible for the practical arrangements of the integration of the PhD candidate:

Dr. T.T.J.M. Berendschot
University Eye Clinic Maastricht, Maastricht University
PO Box 5800, 6202 AZ Maastricht, the Netherlands
t.berendschot@maastrichtuniversity.nl

- To be filled in by the applicant –

1. Information on the applicant

- Initial(s), first name, surname:
- Male/female:
- Current work/study address:

- E-mail:
- Private address:

2. Details of applicant's home university

Note! A separate letter of recommendation by the supervisor or faculty dean of the home university is required.

- Name of home university:
- Address:
- E-mail:
- Website (if available):

3. Applicant's home university Master Thesis supervisor:

- Title(s), initial(s), first name, surname:
- Address for correspondence:
- E-mail:

4. Research field(s)

重大专项 / Major Special Projects

前沿技术 / Frontier Technologies

基础研究 / Basic Research

5. Title of research plan for CSC-UM PhD Programme

Advanced vascular retinal imaging

6. Short summary of research plan

Background:

Diabetes mellites is a chronic disease that is characterized by a low production of insulin by the pancreas or the inability to use insulin effectively, causing high blood glucose levels. It increases the risk of multiple life-threatening health problems, since persistent high blood glucose levels play a role in generalized vascular damage affecting various organs such as the heart, kidneys and the eyes ensuing various complications. As a results, it leads to a 6 year decrease in life expectancy of a 50-year old individual with diabetes compared to an individual without diabetes [1]. Over the past decades, there has been a rise in the global occurrence of diabetes and impaired glucose tolerance among adults. According to the IDF diabetes atlas the estimation of people with diabetes aged 20-79 years was 463 million in 2019, which is expected to climb to 578 million in 2030 and up to 700 million by 2045 [2]. These high numbers show that it is crucial to increase the awareness of this disease and lower the amount of undiagnosed patients

There is a gap between the onset of diabetes mellitus and its clinical manifestations and complications like diabetic retinopathy. Basement membrane thickening and pericyte loss are early changes in the onset of diabetes due to prolonged hyperglycemia. However, currently used clinical imaging techniques are not able to visualize these early changes that continue to advance during this asymptomatic phase. Identifying these at an early stage could enable timely intervention and management for patients at risk.

Study objective and Expected Results

The aim of this project to study the retinal vasculature in great detail using state of the art advanced high resolution retinal imaging, optical coherence tomography angiography and adaptive optics. Since changes in the retinal vasculature reflect changes in the systemic microcirculation [3, 4], they will enable to quantify the early changes in the microvasculature mentioned above. We will use data obtained in the Maastricht Study, an observational, prospective, population-based cohort study enriched with individuals with diabetes. Data used will be from phase 1 and 2 of the Maastricht study, in which individuals from phase 1 are asked to come back for a second round of measurements. The rationale and methodology of the Maastricht study have been described earlier [5]. Recently, in phase 2, adaptive optics and optical coherence tomography angiography have been added as state of the art measurement modalities. Comparing diabetes and prediabetes with healthy increase our understanding of the pathophysiology of diabetes and its consequences.

1. Rao Kondapally Seshasai et al., *Diabetes mellitus, fasting glucose, and risk of cause-specific death.* N Engl J Med, 2011;**364**:829-841
2. Saeedi et al., *Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9(th) edition.* Diabetes Res Clin Pract, 2019;**157**:107843
3. Zaleska-Zmijewska et al., *Retinal Photoreceptors and Microvascular Changes in Prediabetes Measured with Adaptive Optics (rtx1): A Case-Control Study.* J Diabetes Res, 2017;**2017**:4174292

4. Tarr et al., *Pathophysiology of diabetic retinopathy.* ISRN Ophthalmol, 2013;**2013**:343560
5. Schram et al., *The Maastricht Study: an extensive phenotyping study on determinants of type 2 diabetes, its complications and its comorbidities.* Eur J Epidemiol, 2014;**29**:439-51

Group's performance:

Web of Science September, 2023

Tos Berendschot: Publications: 380; H-Index: 46; number of citations 7382

Freekje van Asten: Publications: 30; H-Index: 11; number of citations 407

Carroll Webers: Publications: 335; H-Index: 38; number of citations 5103

7. Motivation for CSC-UM PhD application
Two separate letters are required, one from the student and one from the promotion team.

Freekje van Asten will be the daily supervisor for this project. She is a medical retina specialist and epidemiologist. Her research involves treatment response and phenotype correlations in age-related macular degeneration. Through epidemiological research she gained experience in analysis of large cohort studies and clinical trials.

Dr. Tos Berendschot studies the functional morphology of the human retina by non-invasive optical techniques and has developed devices for quickly and easily measuring Macular Pigment in the human eye, based on the objective technique of fundus reflectance spectroscopy. A particular field of interest is the development of retinal image analysis using innovative, newly developed and robust brain-inspired mathematical algorithms.

Prof. Dr. Carroll Webers is director of the University Eye Clinic Maastricht. He is a leading expert on fundamental and applied research in glaucoma and has been involved in a number of intervention trials.

The University Eye Clinic Maastricht is leading in eye care in the Netherlands, and home to 'the Maastricht Study', an extensive study to diabetes, with eye scans, blood samples, life style data and MRI scans available of 9000 subjects.

Under the guidance of Dr. Berendschot other PhD students from the CSC program successfully enrolled a PhD project. Yuan Tian has obtained her PhD degree September 17, 2015, Shuo Zhang his July 7, 2021 and Shuhe Zhang December 11, 2023. Yu Yu started January 2022 and Lv Liu will start later this year. Prof. Webers is guiding yet another student, Wenting You, who will defend her thesis early 2024.

Applicant's Curriculum Vitae
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8. Personal details

<u>Applicant</u>

- Title(s), initial(s), first name, surname:

CSC-UM PhD programme start 1-9-2024

- Surname:
- Nationality: Chinese
- Date of Birth:
- Country and place of birth:

9. Master's degree (if applicable)
Note! Add a copy of your Master's degree to your application

University:
Faculty/discipline:
City and country:
Date:
Grade average:
Title Master's thesis (if applicable):
Thesis grade: