If you wish to propose a project for our Computer Science Masters Students, but are external to our Computer Science department, please fill in this form and return it to Dr. Jessica Chen-Burger at y.j.chenburger@hw.ac.uk. Many thanks for your interest

Company/Organisation Information:

<table>
<thead>
<tr>
<th>Company/Organisation Name:</th>
<th>PROTEUS (<a href="http://proteus.ac.uk/">http://proteus.ac.uk/</a>), EPSRC Interdisciplinary Research Collaboration (Heriot Watt University, University of Edinburgh, Bath University)</th>
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<tbody>
<tr>
<td>Company/organisation point of contact details:</td>
<td>Antonios Perperidis (<a href="mailto:A.Perperidis@hw.ac.uk">A.Perperidis@hw.ac.uk</a>)</td>
</tr>
<tr>
<td>Company/organisation supervisor (industrial/external supervisor) and contact details:</td>
<td>Antonios Perperidis (<a href="mailto:A.Perperidis@hw.ac.uk">A.Perperidis@hw.ac.uk</a>)</td>
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Location of the Student Placement:
Ideally the prospective student will spend at least 1 day a week at the PROTEUS HUB (Queens Medical Research Institute, Little France, Edinburgh).

1st supervisor (academic supervisor) in DCS MACS, Heriot-Watt University:
Prof Albert Burger

Project Information:

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<tr>
<th>Project Title:</th>
<th>Modular SDK for pre-clinical optical endo-microscope.</th>
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<td>Project Goal:</td>
<td>Develop a modular architecture and accompanying software to drive a novel pre-clinical optical endo-microscope. Ideally, the software should include GUI and SDK options for easy and flexible use by both engineers and life-scientists.</td>
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</table>
| Project Description: | **Background**
Optical endo-microscopy (OEM) is an emerging, fibre-based medical imaging tool. The diameter of the fibre can be as small as 1mm, enabling the real-time microscopic imaging of organs that were previously inaccessible through conventional endoscopy (and many times any other imaging modality). OEM has been employed to image a range of organs, including the gastro-intestinal, urological and the respiratory tracts. In pulmonary OEM, auto-fluorescence generated through the abundant elastin and collagen enables the structural imaging of the lung (Fig. 1). |
**Problem**

Proteus has been developing a multi-spectral optical endo-microscope (see Reference [4]). The device consists of a novel optical setup along with an in-house software that drives the imaging device. However, the device is developed for use in a clinical setup. Consequently, both hardware and software are subjected to a plethora of regulations ensuring the device’s safe and robust operation. Such regulations can restrict the flexibility and modularity of the architecture of the device, that are actually essential in an experimental, in-vitro and ex-vivo environment. There is therefore a need for such a modular and flexible software architecture, so that it can be easily adopted by research teams with limited optics (i.e. signal processing) and/or software (i.e. life-scientists) background.

**Project’s aim**

This is primarily a software design, development and evaluation project, the aim of which is to create a modular architecture and develop the associated software that will drive a OEM device. The modular architecture will facilitate for incorporating a flexible hardware setup (optics and sensors). Ideally, a Graphical User Interface (GUI) will be available for use by life-scientists. Also, an SDK would enable engineers to employ and built upon the available software functionality. Finally, the option of incorporating the developed software as an Image-J plugin would be highly desirable.

This MSc project is part of PROTEUS (http://proteus.ac.uk/), an interdisciplinary research collaboration (3 universities, >50 researchers) aiming in the development of novel biomedical optical imaging platforms. The Software MSc student to undertake this task will be joining a unique, dynamic and diverse research environment working closely with engineers, physicists and biologists for the development of a novel medical device. The anticipated project output (based on performance) is a large contribution to the novel, modular software platform for our new optical endo-microscope, as well as contribution to any associated scientific publications and intellectual property (patents).

**References of interest:**


**Background Required: (e.g. technical skills required by the student)**
This is a software development project so the candidate is required to have strong programming skills. Ability to program in multiple programming languages with stronger background in at least one of Java, Python, C++. Passion for real world applications (medical devices).

**Resources Required: (e.g. tools and systems that the students need to use as a part of the project; please indicate whether the University need to have these systems installed on site or not.)**
Access to a fairly powerful laptop. If access to laptop is not possible, we can try to source one for the duration of the project.

**Difficulty (low/medium/high/challenging): (i.e. given the defined time scale)**
Difficulty ranges from medium to challenging, depending on the ambition of the prospective student.

**Confidentiality issues: (e.g. if the student will need permission to access resources)**
There may be some simple arrangements required with regards to any existing and future Intellectual Property (IP) associated with the project. Details can be ironed out with Proteus’ legal team in due course.

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Fig. 1. Representative examples of frames encountered along the pulmonary tract.
**A Brief Background on Computer Science MSc projects:**

The MSc placement is designed to be a part of a MSc thesis project. The produced results will therefore be evaluated under normal university regulations for MSc thesis.

MSc students will normally start their preparation work for their MSc thesis in Research Methods and Project Planning, as one of their MSc modules, from **January** onwards for about 3 months - when they will carry out background studies and scope project work. The end results will be described in a research proposal. They will then break for exams. The MSc project will resume from **9 May, 2016** for about 3 months, when they will carry out detailed system design, implementation, evaluation and thesis writing, as appropriate. During the **3rd week of August**, the students are required to be back to the University for one day to provide a poster presentation in person. Industrial supervisors are welcome to join in.

Note that each proposal can only be taken and carried out by one student. However, several proposals may be carefully carved out to support each other, without overlapping in their works. Not all projects, however, may be taken by students, as students are free to choose from offered projects; or to propose their own projects.

**Academic Supervisor and Student Selection Process**

As the MSc project is an important part of the student’s MSc degree program, a supervisor from DCS MACS is therefore required. If this information is known, please provide it in the form above. Otherwise, your project description will be advertised among staff, normally from September onwards, or as appropriate, to find a suitable supervisor. In this latter case, we will keep you informed on the outcomes. Once an academic supervisor is identified, the project is normally advertised to students in **December**.

**Health and Safety Issues**

Once a student is identified for your project, prior to the start of the placement (normally from the 3rd week of May), please provide an official letter verifying that your company has the necessary employer and public liability insurances as required by the UK (or EU, as appropriate) laws, to cover the student’s health and safety while working under the placement (i.e. working in a company’s premise). For this, please fill in the University’s official form below (a typical coverage period for this insurance is normally from the 3rd week of May towards the end of August):

http://www.macs.hw.ac.uk/~yjc32/project/CS%20MSc%20placement%20doc/Univ-forms-for-employers/

For more information, please visit: http://www.macs.hw.ac.uk/cs/pgcourses/placements.html