**INTERNship VACANCY FORM**

**DESIGNING FOR MEDICAL IMAGING**

Select one or more of the listed categories that match with the intern position:
- Design Thinking — Strategic Design — Design Innovation — Participatory Design
- Product Design — Industrial Design Engineering — Manufacturing — Computer Science
- Interaction Design — Collaborative Design — Human-Computer Interaction — Information Design — System Design
- Other, respectively, [Enter other category here]

**Category**

| Location of the internship | TU/e, Eindhoven, The Netherlands |
| Internship period          | 2nd semester 2017-18             |
| Application deadline       | December 22, 2017                |

**Details**

We address computer-aided detection of diabetes, hypertension and other vascular disorders. These diseases are exploding - diabetes alone is at 415 million cases, a number that was only expected in 2030. These diseases all cause structural changes in the retina. For example, diabetes can lead to diabetic retinopathy (DR) and eventually blindness. However, some changes already occur in the early stages of the disease, even before clinical symptoms. Automated analysis of retinal fundus images therefore offers possibilities for objective evaluation of a large number of images at a low cost. Recently image analysis systems based on machine learning (ML) have shown promising results, but the development of a robust ML system is still an open task.

ML algorithms need a lot of data to learn patterns of disease as well as possible. While there are a lot of retinal images being acquired, the amount of annotated images is typically much lower, as it is time-consuming for experts to mark abnormalities, such as microaneurysms, in the images. As a result, ML algorithms cannot make the progress they have made in other fields, like recognizing faces.

In other fields where ML is successful, crowdsourcing is often used to collect annotations, for example category labels for images. For a while it was considered too difficult for the crowd to annotate medical images, but a few recent studies have shown promising results, offering a potential solution. Unfortunately standard crowdsourcing platforms were not built with retinal images in mind, and lack interaction possibilities that would be desirable (i) to increase the ease of annotation, and (ii) to motivate the annotators, and as such, to increase quality.

In this project, we will look at designing a dedicated interface for annotating retinal images. A potential annotator could be anyone, but we are at this moment interested in asking e.g. colleagues or students, who would not be paid annotators, but motivated by helping us with the research. We are particularly interested in engaging with annotators that have no domain knowledge whatsoever. The reason for this choice is that we want to emulate a crowdsourcing environment. We expect that most crowdworkers, if not all, would have no knowledge whatsoever of medical imaging annotation. Therefore a salient task of the interface is to educate and guide the annotator.

(for a more detailed description contact: Javed Khan at: v.j.khan@tue.nl)

**Student's responsibilities**

designing the interface, interaction and appropriate motivational aspects of the platform for crowdsourcing the annotation of medical images and specifically those of microaneurysms.

**The company is offering**

this is a project in collaboration with the Medical Imaging group of TU/e and therefore exposure and knowledge on Machine Learning and Artificial Intelligence in the application of medical imaging is offered. Furthermore, close coaching with coaches from both the Industrial Design Department and Medical Imaging group is offered.

**Qualification / Skills**

have affinity with web programming (i.e. HTML, CSS, javascript) want to learn more about Machine Learning, Crowdsourcing and Web apps.

**Contact**

Dr.ir. Javed Khan, Assistant Professor, Industrial Design Dept.

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How to apply

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Opportunities after the internship
(when applicable)