Health Informatics and Systems Analysis of Healthcare Services
PhD

Supervisors: Dr George Despotou, Prof Theo Arvanitis

Funding: 3 years at RCUK standard rates, for UK/EU students

Start date: 1 October 2017

Project overview:
This is an exciting opportunity to join the Institute of Digital Healthcare at WMG, University of Warwick.

Healthcare services have demonstrated an increasing degree of complexity, including increasing number of dependencies on diverse elements. These include people, technologies and equipment, information, and the processes that define how they all need to work to achieve the intended outcome. As a result, healthcare services are increasingly being seen as complex socio-technical systems, consisting of components collaborating towards an objective.

There is a need for systematic and computer-assisted analysis, optimisation, and operational determinism of the services. This includes considering multiple facets such as information exchanges, network communications and interfaces, decision making, and resource allocation. For example, optimising allocation of resources in wards, laboratories, and radiology.

The research undertaken for this project will target the subject of systematic analysis, definition, design, and optimisation of healthcare services, using structured and well defined informatics and engineering techniques.

The scope of the project includes the following research areas:

Capturing and documenting all operational facets of clinical services with a clear and unambiguous modelling using graphical languages, usable by non-experts.

- You will look at existing models and propose a unifying, graphically representable language to model clinical services. Such a language will need to offer multiple viewpoints of interest to all stakeholders in a clinical organisation.

Automated modelling and monitoring of de-facto clinical pathways.

- In dynamic complex socio-technical systems, the resultant behaviour of a system is not always the same as the intended static definition of the service during its design phase. Any deviations from the designed pathway can then be indicated in the graphical version.

Computer assisting mining and generation of healthcare service metrics.

- Metrics provide a useful evidence-based view of the operation of a system. However, it can often be difficult to thoroughly represent a system with a set of pre-determined metrics, as the resolution with which they describe the operation of a system is usually high level, and it is difficult to respond to developing situations. Annotation of the healthcare service modelling language, with
constructs that allow mining of real time metrics, will provide a powerful tool for monitoring any pathway. Clinical operations managers can at any time not only see the overall performance, but also zoom-in to various parts of the overall service, identifying targeted fixes; either in processes, systems, policies, or people.

Optimisation of services.
- This aspect of the research will investigate how the modelled healthcare services can be optimised to increase their efficiency. Algorithms can be applied to the service to simulate operation, identifying weaknesses and rerouting subservices to restore balance. Simulation is a widespread approach to optimising complex systems with notable example network traffic.

You will be expected to work with local NHS trusts, on real case studies, crystallising with them the particular objectives of the project so that they are directly applicable and tested in practice.

Eligibility
Applicants must be UK/EU eligible students and should have a 1st class or 2.1 degree in a relevant subject such as computer science, software engineering, or information technology.

You should have a particular interest in requirements/systems analysis, model driven engineering, computer systems optimisation.

Good programming skills are essential.

To apply
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