

# Developing Real-time Predictive Analytics in an Intensive Care Unit by Processing Streams of Physiological Data

*supervised by*

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The monitoring and alert systems in an Intensive Care Unit (ICU) has to run accurately, 24x7, for all patients being monitored. Patients can arrive on the system and can leave from it at any point in time. Furthermore patients may be disconnected from the monitoring system for finite periods of time. It is thought that these streams of patient data hold valuable information about the patient condition and potential insights into the likely outcome and response of the patient to possible treatments. The purpose of this PhD project is to investigate the streamed data and develop suitable predictive analytics for the patients in real-time.

Previous research by the supervisory team with clinical colleagues in the QUB School of Medicine have developed a prototype system for predictive analytics on streams of respiratory data from ventilators in an ICU. This project aims to create a generalised model for predictive analytics of from respiration to other clinical parameters, and combinations of physiological parameters, thereby giving a more complete view of the condition of each monitored patient. This means that research will focus predictive analytics from values provided by several signals.

In addition to the supervisors, the project will have Dr M. Shyamsundar, a QUB clinical academic and NHS consultant as an advisor to offer expertise from the clinical perspective.

In order to minimise ethical issues of working with actual patient data, the project at least in the first instance seeks to use databases of patient signals publically available which contain physiologic signals and vital signs time series captured from patient monitors, and comprehensive clinical data obtained from hospital medical information systems.

This PhD project is on Data Analytics and therefore requires candidates to have high-level skills in mathematics, statistics as well as computer programming. The student will develop extensive skills including in: C++, C, OpenCL, operating systems, parallel computing, distributed computing, code optimisation, numerical analysis, computational mathematics, databases and computational physiology.