**PhD Project Proposal**

School of Electronics, Electrical Engineering and Computer Science

& ECIT Global Research Institute

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| **Proposed Project Title: High-Performance Graph Analytics** |
| **Principal Supervisor: Hans Vandierendonck Second Supervisor: TBC (pending project details)** |
| **Project Description:**  In the era of big data, numerous data analytics problems require the processing of large graphs. These problems, often referred to as “graph analytics” are challenging to process efficiently. Their scaling in distributed and disk-based processing systems is significantly hindered by frequent communication and by the irregular structure of scale-free graphs. During the past three years, we have made significant findings in relation to load balancing parallel graph analytics and improving memory locality of graph analytics. This research was demonstrated in the GraphGrind graph processing system, one of the fastest research prototypes currently available. The main author, dr Jiawen Sun, became finalist in the EPSRC Connected Nation Pioneers competition for PhD students.  We are seeking excellent PhD candidates to extend this research. A key area of challenge in high-performance graph analytics is the design of data structures for static and dynamic graphs. In this context, solving the push/pull dichotomy is important to make progress. The push/pull dichotomy states that there are important performance differences between “push-based” or “forward” graph traversal versus “pull-based” or “backward” traversal. These performance differences are dependent on the evaluated graph algorithm, hardware details as well as properties of the graph. However, as a whole, the push/pull dichotomy escapes explanation and resolving this conundrum will enable significant progress over the state of the art. Having solved the push/pull dichotomy, the PhD project will leverage this new-found knowledge to design novel graph data structures that support static (constant over time) and dynamic (time-varying) graphs.  Prospective PhD students with an interest in these and other problems in graph analytics are welcome to contact dr Hans Vandierendonck at h.vandierendonck@qub.ac.uk, home page: http://www.eeecs.qub.ac.uk/~H.Vandierendonck/ |
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