

PhD position in Computer Science University of Hertfordshire, UK

Outstanding candidates are invited to apply for a 3 year PhD position in the following areas:

Relative Efficiency of Propositional Proof Systems

Propositional proof complexity is the study of the lengths of proofs of statements expressed as propositional formulas. It is tightly connected in many ways to computational complexity, classical proof theory and practical questions of automated deduction. A classical question of propositional proof complexity is one of the shortest proof of a tautology. A related fundamental problem is to determine the relative efficiency of standard proof systems, where the relative complexity is measured using the notion of polynomial simulation. Although substantial progress has been made in determining the relative complexity of proof systems and in proving strong lower bounds for some relatively weak proof systems, some major problems remain unsolved. A successful candidate is expected to conduct research in the relative efficiency of proof systems.

Reachability Problem for Hybrid Systems

Hybrid systems are dynamic systems that comprise both digital and analog components. Examples of such systems can be found among others in avionics, robotics and bioinformatics, and many of them are safety-critical.

Verifying safety properties typically consists of construction of a set of reachable states and checking whether this set intersects with a set of unsafe states. Therefore, one of the most fundamental problems in the analysis of hybrid automata is the reachability problem.

The reachability problem is undecidable even for simple classes of hybrid automata. Undecidability of reachability is usually proved by the simulation of a Turing-complete abstraction. This way, the existence of an algorithm deciding the reachability problem would solve the halting problem, which is a contradiction. On the other hand, decidability of reachability is typically shown by providing an algorithm which solves it. Despite the increasing interest in discovering new decidability results for hybrid automata, there is still no clear boundary between what is decidable and what is not for such systems. A successful candidate will explore frontiers of decidability of reachability for some low dimensional hybrid systems.

Requirements:

- A strong first degree related to Computer Science or Mathematics
- Strong analytical skills
- Solid background in Logic for the project in Proof Systems, and in Linear Algebra, Differential Equations and preferably Topology for the project in Hybrid Systems
- Proficiency in at least one programming language, such as C, C++, Java, Python
- Good English language skills

General information:

- The University of Hertfordshire is situated in Hatfield, just north off London. The department of Computer Science at the University of Hertfordshire is one of the oldest Computer Science departments in the UK.
- A successful candidate is eligible for studentship about £14.000 per annum.
- The planned start is 1 October 2020 (subject to negotiation).

Contact:

- If you have any questions related to the research area or the application procedure, please contact Dr Olga Tveretina (o.tveretina@herts.ac.uk).
- If you have informal enquiries, you can contact Andrei Sandler (andrei.sandler@psystech.edu).