

### **Postdoctoral Research Associate**

£30,870 starting salary + annual increments.

### **PhD studentship**

Fees paid + an annual maintenance grant of £13,590 per annum for three years.

**1st September 2012 – 31 August 2015**

### **Philosophy Department, University of Kent**

To work with Prof. Jon Williamson on a project to research the relationship between Bayesian epistemology and inductive logic, funded by the UK Arts and Humanities Research Council.

The Postdoctoral Research Associate will focus on the development of a particular inductive logic, analysis of its key properties, and the development of computationally tractable methods for performing inferences in the inductive logic. This will require some familiarity with probability and logic. Programming competence would also be desirable. Applicants will be expected to hold a PhD on a related topic in mathematics, computing, philosophy or a related subject.

The PhD student will focus on the question of whether the resulting inductive logic survives a number of philosophical critiques. This will require competence in philosophical argumentation and knowledge of epistemology and elementary logic. Applicants will be expected to hold a Master's degree, and a Bachelor's degree at class 2(i) or higher; at least one of these degrees should be in philosophy.

**About the project.** The main aim of this project is to revive inductive logic (the logic of inference under uncertainty) by building on recent developments in epistemology (the theory of knowledge and belief).

Inductive logic has potential application to any area in which one needs to reason about structure, but where evidence is limited and uncertainty is rife. For example, bioinformatics requires formal methods for reasoning about biological structure in the presence of only partial knowledge of genetic function and biochemical processes; natural language processing requires formal methods for reasoning about sentence structure and meaning in the presence of statistical evidence of previously processed sentences.

However, after intensive research in the 1950s-70s, the inductive logic programme faced important philosophical critiques from which it never fully recovered. Thus, while there are a few small pockets of researchers still working on logics for reasoning under uncertainty, the inductive logic programme is widely held to have failed.

In the 1980s-90s, new methods for handling uncertainty were developed - probabilistic network methods - which are computational rather than logical techniques. These new methods filled the need for computationally feasible tools for manipulating and reasoning with probabilities, and research on inductive logic remained on the side-lines. However, while probabilistic networks can handle uncertainty in an elegant way, they were not developed for reasoning about structure at the

same time. There are attempts to extend the probabilistic network formalism to cope with richer structure, but these methods are complex and disparate and no clear contender has emerged.

Now is the right time to revive the inductive logic programme. This is for three reasons. First, the need for inductive logic remains: there is still a need throughout the sciences to reason about structure under uncertainty and inductive logic is the natural formalism for fulfilling that need. Second, recent work in epistemology has offered the possibility of developing a new approach to inductive logic that may survive the traditional critiques of inductive logic. In particular, ideas emerging from probabilistic epistemology may offer a coherent approach to inductive logic (see, e.g., "In defence of objective Bayesianism", Oxford University Press 2010). Third, recent work in forging connections between probabilistic logics and probabilistic networks has led to the possibility of developing computationally tractable methods for performing calculations in inductive logic (see, e.g., "Probabilistic logics and probabilistic networks", Springer 2010).

This project will:

- (i) develop the formal apparatus of inductive logic as underpinned by the emerging probabilistic epistemology,
- (ii) investigate whether the resulting logic does indeed survive the traditional philosophical critiques of inductive logic, and
- (iii) develop computational methods, based on probabilistic networks, for performing inference in the resulting inductive logic.

**Research Environment.** Both positions will be attached to the theoretical reasoning research group in the [Philosophy Department](#), based at the Canterbury Campus of the [University of Kent](#). The Philosophy Department runs the interdisciplinary [Centre for Reasoning](#) at the University of Kent, to which both positions will also be attached.

[Canterbury](#) is a small but vibrant city in South-East England, close to the hills of the North Downs and to a variety of coastal towns and beaches, and 40 miles from France. Canterbury is less than 1 hour by train from London, and less than 3 hours by train from Paris and Brussels.

**Application process.** Applicants for the postdoctoral research associate position should apply online for job reference HUM0218 at <http://jobs.kent.ac.uk/>.

Applicants for the PhD studentship should email [Jon Williamson](#) a CV, a cover letter, a piece of written work (if possible, on a topic relevant to the project), and contact details of two referees.

The deadline for applications for both posts is **15<sup>th</sup> February 2012**.

Applicants may be asked for interview, probably on **9th March 2012**, and should keep that date free.