

### Research

I am interested in logics which can deduce sensible conclusions from vague information where the degree of vagueness is not quantified. So there are no numbers such as probabilities or certainty factors. Such vague information may even be inconsistent. Moreover these logics need to be efficient when implemented on a computer.

In particular I invent propositional logics which reason with factual information, like “Whales are mammals.”, and plausible information, like “Mammals usually do not lay eggs.”; recall that the platypus and echidna of Australia are mammals that do lay eggs. The plausible information is represented by defeasible rules, warning rules, and a priority relation on just these rules. The factual information is represented by just strict rules. All rules have the form “antecedent arrow consequent”, where the antecedent is a finite set of (propositional) formulas and the consequent is a single formula.

Strict rules have the form  $A \rightarrow c$ , defeasible rules have the form  $A \Rightarrow c$ , and warning rules have the form  $A \rightsquigarrow c$ . If all the formulas in the antecedent,  $A$ , of a strict rule are proved then the consequent,  $c$ , can be deduced, no matter what the evidence against  $c$  is. If all the formulas in the antecedent,  $A$ , of a defeasible rule are proved and all the evidence against the consequent,  $c$ , has been nullified then  $c$  can be deduced. If all the formulas in the antecedent,  $A$ , of a warning rule are proved then this is evidence against the negation of the consequent,  $c$ ; but it is not evidence for  $c$ .

There are several different proof algorithms. One just uses strict rules and is essentially classical propositional logic. Unlike classical propositional logic, when reasoning with vague information there are different intuitions about what should follow from the vague information. To cater for these different intuitions there are other proof algorithms.

Once a logic has been invented, usually with the aim of solving a particular problem, a large number of results need proving to show that the logic has the desired properties. This is a significant task as the proofs usually take over a year and about 50 pages.