Substructural Epistemic Logics

Igor Sedlár*

Comenius University in Bratislava
Bratislava, Slovakia

In many common epistemic scenarios, the warrant provided by the body of evidence available to an agent does not seem to be closed under classical consequence. It may be the case that evidence gathered during a criminal investigation provides inconsistent information without thereby supporting the existence of extraterrestrials. It may be the case that an agent has gathered enough evidence to see that every axiom of an arithmetical theory is true, but no evidence that supports a specific theorem.

The talk outlines a family of non-classical epistemic logics designed to represent belief supported by available evidence. Our framework is a combination of normal modal logics with modal distributive substructural logics. We use standard substructural relational models as the basis of our semantics, but validity is defined as truth in a set of states representing classical possible worlds. Belief is represented by a binary accessibility relation. The proviso is that is that if y is accessible from a classical possible world x, then y is a classical possible world as well. Available evidence is represented by a function on states. Typically, $e(x)$, the evidence available to the agent in state x, may be a non-classical state even if x represents a classical possible world.

Our basic logic is a combination of the modal logic **K** with the distributive non-associative full Lambek calculus with a simple negation **DFNLe**. The main technical result is a strong completeness theorem for the basic logic and a number of extensions. Several observations pertaining to substructural epistemic correspondence theory are pointed out as well.