SUPPES–STYLE SEQUENT CALCULUS FOR PROBABILITY LOGIC

Marija Boričić
Faculty of Organizational Sciences, University of Belgrade,
Jove Ilića 154, 11000 Belgrade, Serbia
e–mail: marija.boricic@fon.bg.ac.rs

Abstract. Deduction relation naturally connecting a set $\Gamma$ of hypotheses with a conclusion $A$, usually denoted by $\Gamma \vdash A$, presents a basic notion of traditional logic. The framework of approximative and vague reasoning needs a new concept of such a connection enabling to express that ‘$A$ follows from $\Gamma$ with probability $p$’. In this paper, following the Gentzen’s approach to the formalization of the deduction relation, we introduce a system $\text{LKprob}(\varepsilon)$ making it possible to work with the expressions of the form $\Gamma \vdash^n \Delta$, a generalization of Gentzen’s sequents $\Gamma \vdash \Delta$ enriched by the Suppes–style formulae, meaning that ‘the truthfulness probability of the sequent $\Gamma \vdash \Delta$ is greater than or equal to $1 - n\varepsilon$’, for a given small real $\varepsilon > 0$ and any natural number $n$. We prove that our system is sound and complete with respect to the Carnap–Popper–type probability models.

The results contained in this paper were partially presented at the European Summer Meetings of Association for Symbolic Logic, Logic Colloquium 2012, held in Manchester on July 12–18, 2012 (Bulletin of Symbolic Logic, Vol. 20, No. 3, 2015, pp. 401–402 (Abstract)), and Logic Colloquium 2014, held in Vienna on July 14–19, 2014 (Bulletin of Symbolic Logic, Vol. 21, No. 1, 2014, p. 60 (Abstract)).

AMS 2010 Mathematics Subject Classification: 03B48, 03B50, 03B05, 03B55.
Key words: consistency; probability; soundness; completeness.