

# Approximate reasoning: a new look into basic concepts, ideas, and methods

Enrique H. Ruspini

Artificial Intelligence Center  
SRI International  
Menlo Park, California, USA

## Abstract

Classical deductive methods permit to compute the truth-value of logical expressions from knowledge of the truth value of related statements by application of a number of procedural rules. These rules—or inferential methods—are widely accepted as adequate formalizations of sound rational thinking.

Approximate-reasoning methods resemble their classical counterparts in their reliance on well-defined procedures to derive the truth-value of certain expressions from related statements. In approximate reasoning, however, the notion of truth is qualified in a number of ways. The various interpretations of the notion of qualified truth lead to different methodologies, exemplified by probabilistic and possibilistic methods.

Often considered in the past as not being sound analogues of classical methods—thus their description as being "approximate"—these methods are now accepted as being rational formalizations of reliable deductive procedures under specific rules of interpretation (e.g., a proposition is likely true rather than absolutely true).

In spite of such gains in conceptual understanding there are still many areas where specific approximate-reasoning techniques still require further clarification. In our presentation we will review common frameworks that facilitate the comprehensive understanding of approximate-reasoning methods and discuss various methodological problems that still demand further study, particularly as it respect the notions of independence and similarity. We will discuss methodological problems where new paradoxical results demand further understanding of basic concepts (e.g., the Dempster rule of combination) and requirements for a clearer understanding of key notions (e.g., conditioning) underlying approximate-reasoning methods.