

Decision Analysis & Knowledge Engineering

The course primarily refers to methods for decision-making under uncertainty. It deals with analytical approaches to decision making under uncertainty. Decision making processes, decision trees, Bayes-theorem and Bayesian revision, value of information, basic utility theory, multi-attribute decision making, construction and analysis of decision trees and influence diagrams using decision analysis software, quantification of judgments, risk preferences, and degree of risk aversion via subjective expected utility. Generalizations of expected utility theory to problems in which consequences are descriptively complex and multi-attributed are illustrated with applications in engineering and management. The real options approach to strategic choice is treated as a logical extension of decision analysis that employs financial market information to determine and value optimal strategies when managers can flexibly adapt to an unfolding, uncertain future. Applications are given to a wide variety of cases, such as valuing start-ups, manufacturing flexibility, new technologies, oil and gas exploration, and development options. The course also contains an introductory reference to approximate reasoning, fuzzy decision analysis and computational intelligence-based approaches for the handling of uncertainty, in real-world problems (soft computing, fuzzy rule-based systems, neural computation, machine learning and mathematical logic based reasoning, evolutionary computing – genetic programming, hybrid and adaptive intelligent schemes).