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Risk-Aware Control Theory

Risk-aware control theory is a fascinating subfield of stochastic control theory. This subfield concerns the analysis and control of dynamical systems with respect to a vast spectrum of possibilities between the average case and the worst case. The flexibility and generality offered by risk-aware control theory has broad significance because control systems often require an awareness of rare harmful possibilities without being overly cautious and different applications have different needs and preferences about managing uncertainty. Major early players in this area include David Jacobson (1970's) and Peter Whittle (1980's-1990's). There have been many exciting developments since those times, motivated by advances in finance and operations research in the early 2000's. In this talk, I plan to present an overview of risk-aware control theory along with the recent development of risk-aware safety analysis. This is joint work with Michael Fauss (Educational Testing Services, Princeton, NJ) and Kevin Smith (Environmental and Water Resources Engineering, Tufts University).